Getting Started

SIMPROCESS

Release 2.2

CACI
Products Company

Table of Contents

Organization of the SIMPROCESS Documentation Set

The SIMPROCESS documentation set consists of two manuals:

- *Getting Started With SIMPROCESS*
- *SIMPROCESS User's Manual*

Getting Started

The *Getting Started With SIMPROCESS* manual is a must for first time SIMPROCESS users. This manual can also be used for evaluation purposes. Chapter 1 provides an overview of Process Modeling and Analysis and the SIMPROCESS product. Chapter 2 provides system requirements and installation instructions. Chapters 3 and 4 of the *Getting Started With SIMPROCESS* manual provides a tutorial and Chapter 5 provides a description of the demonstration and reference models.

User's Manual

The *User's Manual* is distributed in electronic format with SIMPROCESS. It can be opened directly from the SIMPROCESS Installation CD, or from the **Help/On-line Documentation** menubar option.

The *User's Manual* is divided into three parts. Part A is an excellent reference for beginners and casual users. This part contains a detailed documentation of the basic and intermediate functions of SIMPROCESS. Chapters 1 and 2 provide SIMPROCESS terminology and basics. Chapter 3 provides a detailed description of SIMPROCESS Statistical Constructs and their use. Chapter 4 describes in detail how the SIMPROCESS Activity Modeling blocks are used. Chapter 5 describes the use of Resources. Graphical Modeling Constructs are covered in Chapter 6. Chapter 7 is dedicated to Activity-based Costing. Chapter 8 covers the Output Reports for analysis.

Part B is a reference intended for advanced users of SIMPROCESS. This part contains a detailed documentation of the programming and library management functions in SIMPROCESS Professional. Chapter 9 provides documentation of the Reusable Templates and Library Management. Chapter 10 covers the Advanced SIMPROCESS constructs such as attributes, expressions, and timestamps. Chapter 11 wraps-up the advanced features of SIMPROCESS with descriptions of the complex features of the Generate activity and Downtime Schedules for Resources.

Part C describes the integrated statistical and drawing tools included with SIMPROCESS Professional. Chapter 12 of this manual provides an introduction to data analysis and Stat::Fit. Chapter 13 covers using the SIMPROCESS Database, while Chapter 14 discusses using the graphics editor tool, SimDraw.

CHAPTER 1

Business Process Modeling With SIMPROCESS

This chapter gives you an overview of business process modeling with SIMPROCESS, its applications, unique features, basic and advanced modeling constructs, and benefits.

What is Process Mapping? Why Map Business Processes?

Understanding what a business does and how it does it requires documenting the inputs, processes, outputs, and resources. This is called process mapping. Process mapping combines the simplicity of flowcharting with the documentation features of word processing.

Typically, executives and managers of industrial and service enterprises have managed their businesses by executive summaries and organizational charts without understanding the processes and their performance. However, executives and managers who are successful now are the ones that understand their business processes in detail. Process mapping includes several missing pieces from the organizational chart: the customers, the products and the workflow. Process mapping enables you to see how work actually gets done, which is through processes that cut across functional boundaries. The definition of boundaries provides managers with the ability to define customer-supplier relationships through which products and services are produced.

What is Process Simulation?

Process simulation is the technique that allows representation of processes, people, and technology in a dynamic computer model. There are essentially four steps in doing business process simulation. They are: 1) building a model, 2) running a model, 3) analyzing the performance measures, and 4) evaluating alternative scenarios. A model, when simulated, mimics the operations of the business. This is accomplished by stepping through the events in compressed time while displaying an animated picture of the flow. Because simulation software keeps track of statistics about model elements, performance metrics can be evaluated by analyzing the model output data.

Re-engineering gurus, Michael Hammer and James Champy, note in their book that only about 30 percent of the re-engineering projects they have seen were successful. One of the primary reasons for this low success rate is that often the analysis behind performance estimates of re-engineered processes have been prepared with flowcharts and spreadsheets. Business processes are much too complex and dynamic to be understood and analyzed by flowcharting and spreadsheet techniques. Although flowcharts and spreadsheets are adequate in answering "what" questions, they are inadequate for answering "how," "when," or "where" questions. This has resulted in overly optimistic performance benefits such as cost savings, throughput and service level increases that were promised by BPR (Business Process Reengineering).

Typically, a BPR project begins with the end in mind where the end goal is to achieve one or all of the following objectives:

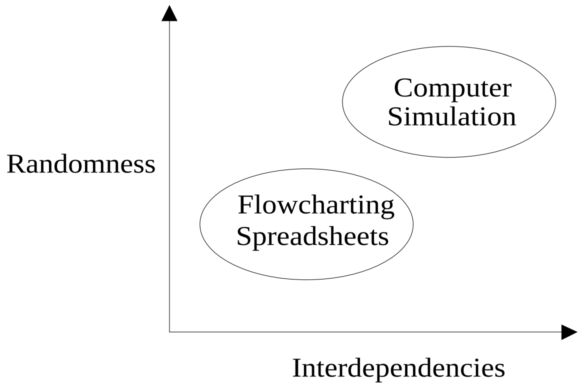
- Increase service level
- Reduce total process cycle time
- Increase throughput
- Reduce waiting time

- Reduce activity cost
- Reduce inventory costs

BPR and IT (Information Technology) professionals often consider or recommend the use of basic principles in order to achieve the goals of a BPR project. Some of those principles are:

- Combine duplicate activities
- Eliminate multiple reviews and approvals
- Automate repetitive tasks
- Reduce batch sizes
- Process in parallel
- Implement demand pull
- Outsource inefficient activities
- Eliminate movement of work
- Organize multi-functional teams

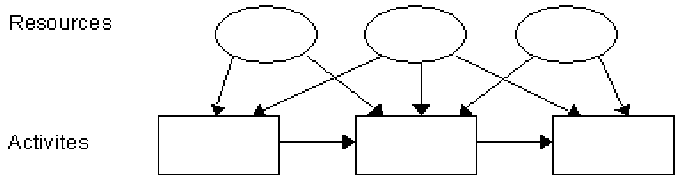
These principles clearly offer answers to the question of “What needs to be done?” to achieve the desired BPR objectives. But, re-engineering business processes involves changes in people, processes and technology over time. The key phrase here is “over time.” The interactions of people with processes and technology over time result in a large number of scenarios and outcomes that are impossible to comprehend and evaluate without the help of a computer simulation model. This is where simulation provides the greatest value for achieving BPR objectives. By tweaking decision variables in a model without the cost and risk of disrupting existing operations, or building a new system, one can accurately predict, compare, or optimize the performance of the re-engineered process.



For example, the BPR professionals, who are designing the customer service process for a call center, must understand the random nature of calls arriving at the center, the random nature of processing times, the interdependencies between customer representatives, and the alternative routing schemes. They must take into account the dynamic nature of these behaviors in a model. If the performance goal is to achieve 100 percent service level or eliminate customer waiting times, a simulation of the process is absolutely necessary to accurately determine staffing requirements, telecommunications technology requirements, and how services are provided to the callers.

What is Activity Based Costing?

Activity Based Costing is a technique for accumulating cost for a given cost object (i.e. product, service, customer) that represents the total and true economic resources required or consumed by the object. Activity Based Costing occurs in two phases. First, cost data is reorganized into activity cost pools. In other words, costs of significant activities are determined. This first phase is sometimes referred to as *activity based process costing*. Then, the amounts in the cost pools are assigned to products, services or other cost objects. The second phase is referred to as *activity based object costing*.

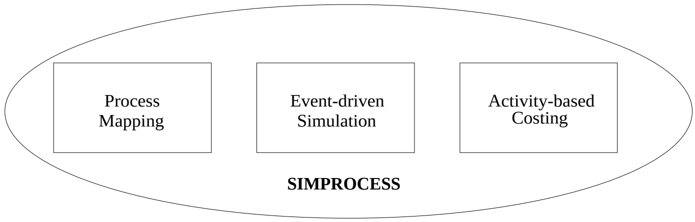


The goal of ABC is to model the causal relationships among resources, activities, and entities in assigning overhead costs. “The fundamental belief behind this costing approach is that cost is caused and causes of cost can be managed. The closer you can come to relating the costs to their causes, the more helpful your accounting information will be in guiding the management decisions of your business.” states the *Ernst & Young Guide to Total Cost Management* (Ernst & Young, 1992).

Enterprises use resources to conduct activities. Resources perform activities to benefit products and services. The key to understanding cost dynamics in any enterprise is modeling the relationship between activities and their causes; and the relationship between activities and costs. If cost dynamics are not modeled (which is usually the case with traditional management accounting information systems), the performance information provided is incomplete or misleading.

What is SIMPROCESS?

SIMPROCESS is a hierarchical and integrated process simulation tool that radically improves your productivity for process modeling and analysis. SIMPROCESS is designed for BPR and IT professionals of industrial and service enterprises who need to reduce the time and risk it takes to service customers, fulfill demand, and develop new products.



Unlike other tools, SIMPROCESS integrates process mapping, hierarchical event-driven simulation, and activity-based costing into a single tool. The architecture of SIMPROCESS provides an integrating framework for ABC. The building blocks of SIMPROCESS, namely processes, resources, and entities (flow objects), bridges ABC and dynamic process analysis. ABC embodies the concept that a business is a series of inter-related processes, and that these processes consist of activities that convert inputs to outputs. The modeling approach in SIMPROCESS manifests this concept, and builds on it by organizing and analyzing cost information on an activity basis.

What Makes SIMPROCESS Unique?

SIMPROCESS is the first integrated tool that is specifically designed for business process modeling and analysis. SIMPROCESS combines process capture and event-driven simulation with activity-based costing. Here are some of the other features that distinguish SIMPROCESS from other modeling and analysis tools.

Hierarchical, Event-driven Simulation

SIMPROCESS is based on CACI's breakthrough simulation technologies MODSIM and SIMOBJECT. These underlying technologies provide hierarchical and event-driven simulation capabilities that had been previously unavailable for modeling large scale applications. Unlike the hierarchical representations of processes using attached diagrams or files, SIMPROCESS offers true hierarchy based on object-orientation.

Activity-based Costing

The breakthrough activity-based modeling paradigm and resource constructs of SIMPROCESS offer a natural fit for its powerful activity-based costing engine. Activity-based costing is designed into SIMPROCESS, unlike other simulation tools, giving you automatic cost reports. One of the major challenges in successful implementation of ABC is finding the appropriate level of detail for the business process analysis. The organization of business processes is critical to reorganizing the cost data into activity pools. The hierarchical modeling approach of SIMPROCESS facilitates this organization and accommodates varying levels of detail for ABC analysis.

Methodology Independent Process Modeling

Some of the process modeling tools force you to learn a new methodology such as IDEF or systems dynamics. SIMPROCESS provides you with a flexible process modeling environment that is adaptable to any methodology that you choose. The process documentation features of SIMPROCESS are far superior to typical flowcharting or simulation tools because it is specifically designed for business process modeling and analysis.

Activity-based Modeling

SIMPROCESS utilizes a breakthrough activity-based modeling paradigm. Real-world behavior of activities such as copying, assembly, transformation, batching, and branching are built into SIMPROCESS. These activities can be connected or embedded into processes using simple flowcharting techniques making process documentation quick and meaningful. You can even customize these built-in activity blocks to represent the operational characteristics of your own business processes.

Reusable Templates

SIMPROCESS lets you create reusable templates from its basic building blocks and activities. You can save these templates in a library and make them available to a cross functional team for reuse. This capability is a tremendous advantage for organizations that want to capture and maintain the most valuable asset of a business — the process knowledge.

Advanced Modeling Constructs

Most BPR tools that provide simulation functionality use simplistic modeling constructs. When modeling the dynamics of real-world business processes, powerful functions such as attributes, expressions, and IF-THEN-

ELSE logic are needed. SIMPROCESS provides these advanced modeling functions and eliminates the limitations of simplistic tools.

Powerful Resource Modeling Constructs

Accurate resource modeling requires model building blocks that allow you to define the shared and consumable behavior of real-world resources. The powerful SIMPROCESS resource engine gives you flexible allocation schemes that provide you with realistic representation of real-world resource behavior.

Comprehensive Statistical Analysis

SIMPROCESS contains links to other tools. This suite of tools can be used to fit input data to a distribution and to analyze the results from multiple simulation runs. Stat::Fit is a comprehensive data analysis tool developed by Geer Mountain Software Corporation. It can be used to fit analytical distributions to user data. Also, simulation results can be exported to a MS Access database for detailed analysis.

Multi-platform Support

SIMPROCESS runs under Windows 95, 98, and Windows NT operating systems. Your models are fully compatible across platforms—giving you the flexibility to run large simulations on faster computers and take advantage of your existing hardware. As hardware and operating system technology moves forward, SIMPROCESS will take advantage of them and protect your investments.

Benefits of SIMPROCESS

From superior technological capability to radical productivity improvement and reduced cost ownership, SIMPROCESS offers four major benefits over other BPR tools. These benefits are:

Breakthrough Technology

Because SIMPROCESS is developed using MODSIM and SIMOBJECT, CACI's object-oriented and graphical simulation languages, it provides you with a breakthrough, hierarchical simulation capability which was previously unavailable.

Radical Productivity Improvement

Because of the hierarchical and object-oriented modeling capabilities, SIMPROCESS enables cross-functional teams to work on projects simultaneously minimizing the time to get results.

Dramatically Short Learning Curve

Because SIMPROCESS gives you a completely graphical modeling environment with flowcharting-like interface, you can learn it in a matter of hours.

Significantly Reduced Cost of Ownership

Because SIMPROCESS is an integrated process capture and analysis tool, it eliminates the need to purchase multiple products from multiple vendors. This combined with the availability of reusable templates significantly reduces your cost of product ownership over time.

Benefits of ABC with SIMPROCESS

Significant value of the ABC analysis in SIMPROCESS comes from the dynamic analysis of costs based on the event-driven simulation. Because SIMPROCESS keeps track of resource interdependencies and captures the random nature of processes, the cost statistics provided by

SIMPROCESS are far more accurate than results obtained from static analysis. Primary benefits of ABC with SIMPROCESS are:

Focus on Cost Drivers

One of the most important benefits of ABC is the focus it provides for estimating the key causes of costs. Executives can use these estimates to prioritize and monitor improvement efforts. For example, understanding the cost of poor quality can justify the investment in a quality program. Likewise, understanding the cost of complex or diverse products and services can help streamline the product and service offerings.

Strategic Pricing

Life cycles of product and services are becoming shorter and shorter. The up-front costs of developing, testing, and marketing are not recouped until revenue is generated. Understanding the cost trade-off between life cycle stages is critical to strategically pricing the products. That is, understanding when the total investment in product development can be recouped is valuable information for strategic pricing. ABC with SIMPROCESS allows simulation of the process changes during the life cycle of a product/service for strategic or time-based pricing.

Evaluation of Capital Investments

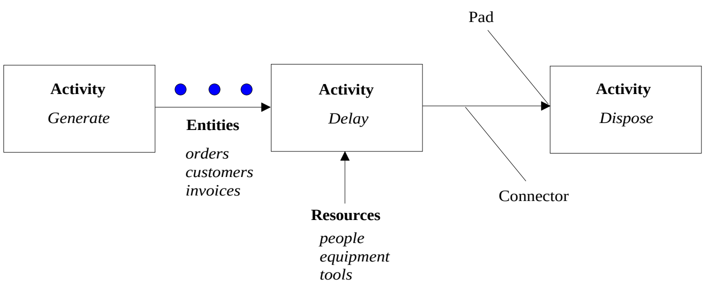
Reengineering business processes requires a trade-off between the benefits and costs of making process improvement changes. Without the trade-off, executives and managers are faced with making large investment decisions based on gut feel. ABC with SIMPROCESS provides an analytical tool for accurate evaluation of capital investments.

SIMPROCESS Modeling Constructs and Terminology

SIMPROCESS modeling constructs can be categorized into three major categories. The *basic modeling constructs* are the minimum functions needed to have a working model. The *activity modeling constructs* are used for defining the behavior of processes. The *advanced modeling functions* are the features needed for customization and more complex modeling. A brief overview of the SIMPROCESS constructs are presented below.

Basic Modeling Constructs

The diagram below illustrates the basic modeling constructs and how they are used in a SIMPROCESS model.



Processes and Activities

A key distinguishing feature of SIMPROCESS is its hierarchical process modeling capability. This enables you to decompose a process into as many levels of detail as required. The Process construct allows you to create the hierarchy. A process may have several sub-processes and activities. For example, an inspection process that consists of a BRANCH activity and two DELAY activities can be defined as a hierarchical process template.

Resources

Resources are the second important modeling construct of SIMPROCESS. In the real world, the performance of business processes are usually constrained by the limited availability of resources or by resource interdependencies. SIMPROCESS allows you to define the costs, capacity, usage, and interdependencies associated with resources. It automatically keeps track of the resource's utilization and costs. Another unique aspect of SIMPROCESS is its ability to represent the hierarchical nature of resources using Departments and Workgroups. Schedules and Downtimes can be modeled to mimic the dynamic behavior of resources.

Entities

The third building block of a SIMPROCESS model is the Entities (or flow objects) that flow through the process model. Entities can be used to represent physical things (orders, paperwork), or logical things (signals, flags). Entities may be assigned attributes to define such characteristics as order size and customer type. Entities are created using the GENERATE activity and disposed using the DISPOSE activity.

Connectors

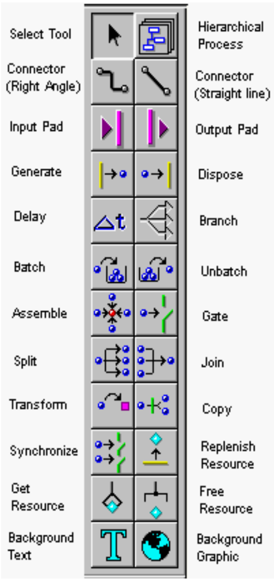
Connectors are the links between processes or activities. They are used for defining the flow of entities. Connectors are objects in their own right with characteristics such as selection and attributes.

Pads

Pads are the objects used for linking connectors between processes or activities. A process may have multiple pads for input or output.

Activity Modeling Constructs

Activity modeling constructs are the objects at the lowest level of the SIMPROCESS hierarchy and they are used for modeling the behavior of a process. Activities are non-decomposable. The default SIMPROCESS palette bar contains 18 built-in activity blocks; however, you can create your own re-usable activity templates and add them to your palette bar. Below is a basic overview of the SIMPROCESS activity modeling constructs.



Generate

A GENERATE activity generates the arrival of entities into the model. Arrivals may be random, deterministic or conditional. An example of a GENERATE activity is the arrival of patients in a clinic. A GENERATE activity may have values for arrival time, quantity, frequency and occurrences.

Dispose

A DISPOSE activity disposes of the entities when they are finished with processing. A DISPOSE activity can be used for collecting customized statistics for throughput or throughput time.

Delay

A DELAY activity defines value added or non-value added activity times. It is one of the most commonly used activities in SIMPROCESS. A DELAY activity with resource constraints provides queue statistics that can be used for analyzing wait times.

Assemble

An ASSEMBLE activity assembles multiple entities coming from multiple sources to create a single entity. For example, the development of a business proposal may contain three documents that are merged using an assembly activity.

Branch

A BRANCH activity allows for defining alternative routings for flow objects. Branching may be based on a probability or a condition. For example, the outcome of an inspection process may be modeled using probabilistic branching.

Merge

A MERGE activity provides a mechanism for merging a number of connectors into a single connector.

Batch

A BATCH activity combines a given quantity of entities into a single batch. An example of a batching activity is the accumulation of mail for delivery.

Unbatch

An UNBATCH activity splits a previously batched entity into individual entities. For example, unloading of a truck that results in multiple loads may be modeled with an unbatch activity.

Split

A SPLIT activity takes an incoming entity and creates clones of that entity as well as providing an output of the original entity. For example, clones of a purchase order may be created with a SPLIT activity and sent to accounts payable and shipping.

Join

A JOIN activity takes the clones and original entity that were split up, and matches them to produce the original one. For example, a JOIN activity may be used for matching the paperwork with the shipment.

Transform

A TRANSFORM activity converts an incoming entity into another entity. For example, a prospective buyer is transformed into a customer when an order is placed. This activity can be modeled using the transformation construct.

Copy

A COPY activity makes multiple copies of the original entity. For example, if a document is being edited in a groupware software that results in multiple copies of a file, this activity may be modeled using a COPY activity.

Gate

A GATE activity holds entities in a queue, until a signal is received. For example, a GATE activity would be used to model orders held in inventory until a signal is received from the distributor to fulfill the demand.

Assign

An ASSIGN activity provides a mechanism for defining or changing attribute values.

Synchronize

A SYNCHRONIZE activity takes inputs that arrive at different times and outputs them in a synchronized fashion. For example, passengers and their baggage must be synchronized at a terminal.

Replenish Resource

This activity allows for replenishment of consumable resources.

Get Resource

This activity provides a mechanism for capturing resources that may be used for a number of downstream activities.

Free Resource

This activity provides a mechanism for releasing resources that were captured by a GET RESOURCE activity.

Advanced Modeling Functions

Advanced modeling functions are very important for realistically modeling the complex behavior of business processes. These functions of SIMPROCESS differentiate it from other BPR tools that are based only on simplistic modeling functions. The advanced modeling functions combined with programming capabilities provide the power and flexibility to accurately analyze the dynamic behavior of real-world business problems.

User Defined Attributes

User defined attributes allow you to attach tags to entities that travel through the model. Attributes can be used for conditional branching, sequencing, or decision making in expressions or logic. For example, order quantity may depend on which customer the order came from. Furthermore, order processing time may depend on the size of each order. By defining an attribute named “order quantity” and writing an expression that multiplies “order quantity” by “process time per order,” you can accurately model the order processing delay activity in your model.

Built-in Attributes

These attributes keep track of the states of model elements so that expressions can be written to deal with complex business situations. For example, the number of customers waiting for a service representative is a system attribute that changes over time. In a typical service process, the number of servers would be increased if the customers in line reach a certain number.

User-defined Expressions

When modeling real-world business processes, you will inevitably come across situations which will require modeling functionality that is not built-into a BPR tool. SIMPROCESS provides you with the capability to write user-defined expressions and use them for modeling or customizing the performance measures. For example, service level may be an important performance measure for a business that is trying to fulfill orders within a 48 hour window from the time orders are placed. Using system attributes, user-defined attributes and user-defined expressions, you can compare the cycle time for each order with the 48 hour target and calculate the service level of the process.

Built-in Programming Environment

Although the built-in functionality and the ability to customize models with attributes, expressions, and distributions offer plenty of power for modeling most business processes, there may be situations where you will need added flexibility that can only be achieved by a programming environment. For these complex business process applications, SIMPROCESS gives you a built-in programming environment.

Built-in & User-defined Distributions

SIMPROCESS provides you with 14 standard probability distributions and allows you to create your own empirical distributions based on raw data. One of the unique features of SIMPROCESS is its built-in data analysis (curve fitting) function. This capability allows you to feed a number of data points into the software and get the distribution that best represents the data set.

Reusable Modeling Templates

One of the most powerful features of SIMPROCESS is that you can create modeling templates that can be stored in a library and used over and over. For example, you can define an inspection process template using three SIMPROCESS activity blocks such as DELAY (inspection activity), BRANCH (probabilistic outcome of inspection), and DELAY (rework activity). Then, you can attach your favorite inspection graphic and save the inspection template in your library. Every time you need to model an inspection process, you simply click on the inspection graphic, drop it in your model diagram, and double-click on it to customize its parameters. One extremely powerful use of this feature is in creating templates that represent the operational behavior of automated process equipment.

Event Logs

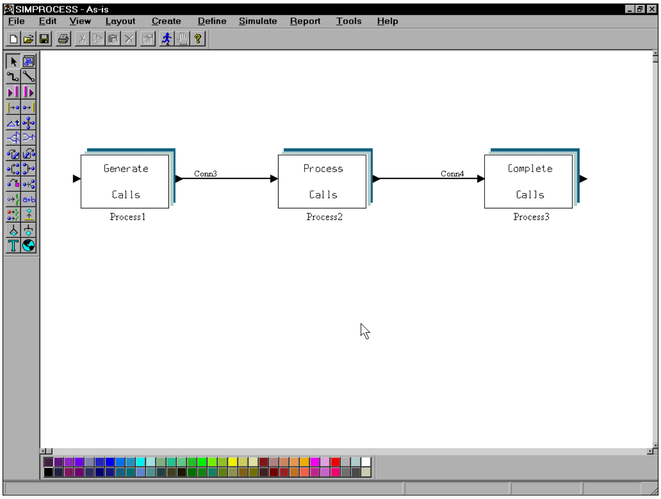
Event logs are built-in features for tracking custom performance measures. Timestamp event logs can be used for monitoring statistics such as makespan and in-process inventory. Recorder event logs can be used for monitoring statistics such as arrival and departure rates.

How Does SIMPROCESS Work?

SIMPROCESS uses four easy steps to model your processes.

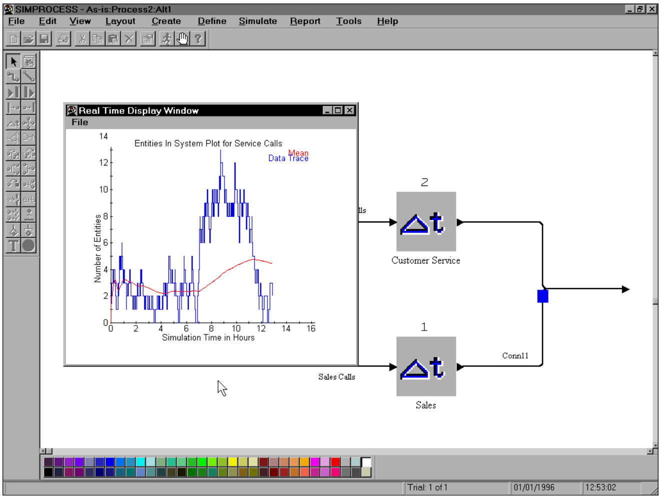
Step #1. Create Your Process Model

Creating a process model using SIMPROCESS is as easy-as 1-2-3. First, you graphically select activities and processes from the tool palette and link them using connectors to define the process flow. Second, you define the entities (or flow objects) and resources used in the model. Third, you customize the behavior of your model and create a realistic model of your business process by filling in the dialog boxes. It's that simple!



Step #2. Simulate Your Process

Before simulating your model, you select the performance measures of interest. For example, you may be interested in throughput and cycle time reports for entities, activity costs for processes, and utilization reports for resources. When you run the simulation, SIMPROCESS automatically verifies your model and begins advancing the simulation clock. During the simulation, SIMPROCESS provides you with an animated picture of the flow that helps you visualize your process in motion. You can also have SIMPROCESS generate real-time graphs, letting you view key performance measures, during the simulation.



Step #3 — Analyze the Results

When the simulation is over, you can bring up your model results and analyze the performance measures of interest. In addition to the automatically generated cycle time, throughput, waiting time, resource utilization and cost reports, SIMPROCESS allows you generate custom reports for tracking service levels or in-process inventory. All SIMPROCESS reports can be viewed within SIMPROCESS or exported to other software packages.

Step #4. Evaluate "Alternatives"

The primary purpose of using SIMPROCESS is to evaluate alternative business decisions. To facilitate this important decision support activity, SIMPROCESS provides a unique function called "Alternative Sub-processes". The "Alternative Sub-processes" function allows you to create alternative representations of a business process utilizing its object-oriented interface. Using this powerful function, you set up your business alternatives. When your simulations are run, you can compare the alternatives and choose the one that maximizes your service levels and profits.

SIMPROCESS Applications

SIMPROCESS provides a rich array of integrated functions for modeling and analysis of business processes. From customer service to product development, from administrative to production processes, for every business process, SIMPROCESS allows you to visualize and evaluate the results of process changes before you commit expensive resources, time, and money. Below are three applications where SIMPROCESS was used for effective business decisions.

An Order Fulfillment Application

A major Fortune 100 industrial enterprise was faced with a problem in one of its computer products business due to high inventory and low service levels. The proposed solutions included reduction of channel inventory and building product to order. SIMPROCESS was used in the reengineering project that resulted in a 50 percent reduction in inventory and a 63 percent increase in service level.

A Licensing Process Application

A state government hired CACI to help reengineer its business processes that suffered from long service time and high cost per transaction. The proposed solutions included implementation of an automated workflow and imaging system as well as a full service counter. SIMPROCESS helped analyze the alternative solutions that increased throughput time from 80 days to 56 days, and reduced cost from $70 to $46 per transaction.

An Engineering Change Order Application

A major European automotive manufacturer was trying to shorten the time required for design changes in its product development process. The design changes originated in Europe and were implemented in South America. The business processes involved resources from designers to process engineers to purchasing agents. First, SIMPROCESS was used to create process maps and simulations of the AS-IS process. Then, TO-BE alternatives including policy changes and workflow automation were simulated to determine impact on cycle times.

CHAPTER 2

Installation

This chapter provides you with the minimum and recommended platforms for SIMPROCESS and the installation instructions for those platforms. In case you need assistance with installation, instructions are provided for getting technical support from CACI.

Hardware and Software Requirements

One of the unique features of SIMPROCESS is that it runs on multiple platforms. Before installing SIMPROCESS on your computer, you need to review the hardware and software requirements and make sure that your system meets the minimum requirements.

System Requirements

Operating System	Minimum Requirements	Recommended
Windows 95, 98 and NT	486 processor w/16 Meg RAM, VGA	Pentium processor w/32 Meg RAM, SVGA

Please review these minimum requirements carefully before installing SIMPROCESS on your computer.

Installing SIMPROCESS on Windows 95, 98, and Windows NT

SIMPROCESS comes on 1 CDROM. The installation program decompresses and copies the SIMPROCESS files from the CDROM to your computer. The installation process is very simple and takes just a few minutes. To install SIMPROCESS:

- Insert the CD into your CDROM drive. The installation program should start automatically.
- Select Install SIMPROCESS.

The installation program will create the following default directories:

SPSYSTEM

This directory contains the SIMPROCESS system files. The `SPSYSTEM` directory contains several subdirectories, namely— `SG2LIBS, OBJLIBS, HELP, SIMDRAW, STATFIT,` and `TEMPLATES`.

SPUSER

This directory serves as the default working directory for users and contains several subdirectories. When you create new models they are stored under the `SPUSER` subdirectory. The demo models and reference models are also located here.

When completed, the installation program creates a Windows Program Group containing the SIMPROCESS application, the Release Notes, and Help. Upon completion of your installation, please read the Release Notes for last minute changes that may be incorporated after the time this document was prepared.

Starting SIMPROCESS

To start SIMPROCESS and test your installation:

1. Double-click on the SIMPROCESS icon and wait until the main menu comes up.

   Note for Windows 95 and 98 users: Drag the SIMPROCESS shortcut from the SIMPROCESS program group and place it on your Desktop. Double-click on the SIMPROCESS shortcut to open SIMPROCESS. Otherwise, to start SIMPROCESS, use the **Start** menu or Windows Explorer to find `SIMPROC.exe`.

2. From the SIMPROCESS main menu, select the **File/ Open** option.

3. Select one of the demonstration or reference models (located in the `Demos` subdirectory of the `SPUSER` directory) and open the file.

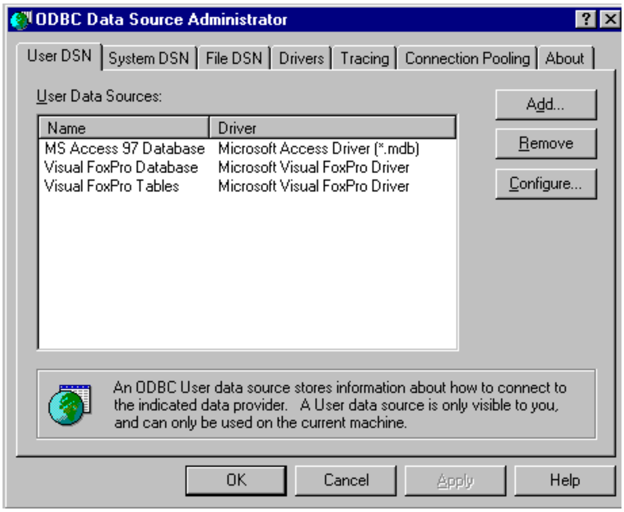
4. Click on the Runner icon in the tool bar to start running the demo model.

If you are able to load a demonstration model and run it, that means the installation process is successful. If you have any problems installing SIMPROCESS, please contact CACI's SIMPROCESS Technical Support at: (858) 457-9681.

Connecting the Database to SIMPROCESS

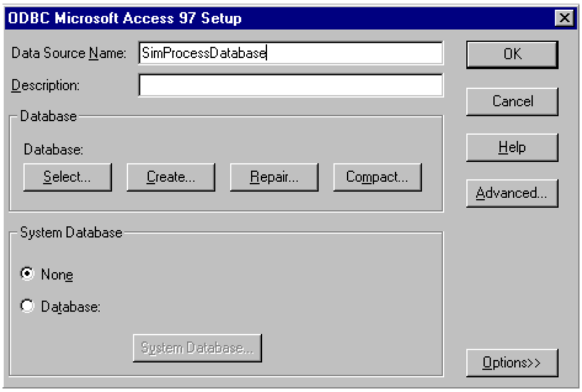
To connect SimProcDB.mdb to SIMPROCESS

- Double-click on your computer’s ODBC Control Panel.
- With the **User DSN** tab selected click on **Add**.

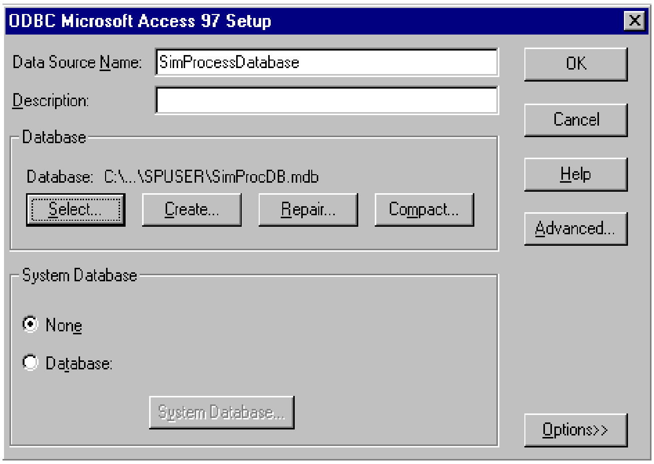


- Select `Microsoft Access Driver (*.mdb)` and click **Finish**.

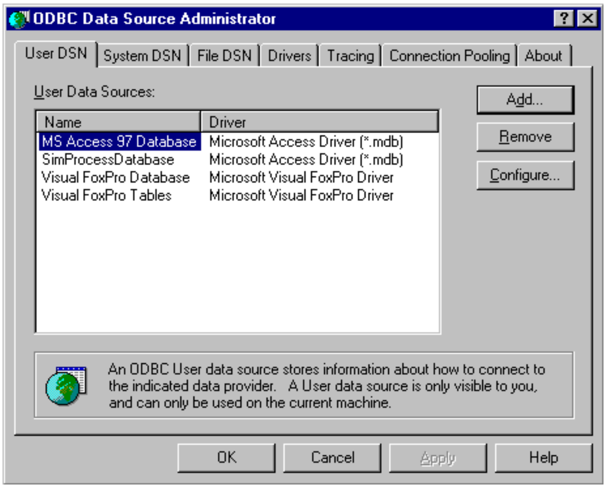
- After the Microsoft Access 97 Setup dialog appears, type in `SimProcessDatabase` (all one word with the letter case as shown) for **Data Source Name**.



- Under the **Database** heading, click on **Select** and browse to find `SimProcDB.mdb` in the SPUSER directory. Once selected the database should be listed above the **Create** and **Repair** buttons.



- Click **OK** and you should see `SimProcessDatabase` listed on the User DSN dialog.


ODBC Data Source Administrator
User DSN
System DSN
File DSN
Drivers
Tracing
Connection Pooling
About
User Data Sources:
Add...
Remove
Configure...
Name
Driver
MS Access 97 Database
Microsoft Access Driver (*.mdb)
SimProcessDatabase
Microsoft Access Driver (*.mdb)
Visual FoxPro Database
Microsoft Visual FoxPro Driver
Visual FoxPro Tables
Microsoft Visual FoxPro Driver
An ODBC User data source stores information about how to connect to the indicated data provider. A User data source is only visible to you, and can only be used on the current machine.
OK
Cancel
Apply
Help

Installing SIMPROCESS on Local Area Networks

SIMPROCESS for local area networks comes on various types of media depending on the desired platform and network configuration. Therefore, installation instructions for SIMPROCESS for LAN are provided with the media specific to the desired platform and network.

Getting Technical Support

CACI Products Company provides worldwide technical support for its licensed users from its corporate offices in La Jolla, California in the United States. Our office hours are from 8:00 a.m. to 5:00 p.m. local time. When you are calling and faxing for technical support please address your inquiries to: SIMPROCESS Technical Support.

In order to expedite responses to your technical problems or questions, we request that you use e-mail to send your questions to `simprocess@caciasl.com`. Please refer to the version number and date that appears under the **Help/About SIMPROCESS** when reporting problems. If you have a model that demonstrates the problem you encountered, please attach the model file to your e-mail.

CHAPTER 3

Building Your First Model With SIMPROCESS

This chapter gets you started with your first SIMPROCESS model. The purpose of this chapter is to familiarize you with creating a basic SIMPROCESS model, simulating the process, and analyzing the performance measures of the process. First, a description of the tutorial model is given. Then, a step-by-step tutorial is provided.

Model Description and Objectives

This model is a description of a call service process for a mail order business. Calls arrive at the mail order business and are routed by an automated answering system to either the customer service or sales department. Customer Service Calls arrive based on an Exponential distribution with a mean value of 6 minutes (0.1 hours). This means that a call arrives on average every 6 minutes. Sales calls arrive based on an Exponential distribution with a mean value of 3 minutes (.05 hours). While the customer service calls take about 15 minutes (use Normal Distribution with a mean of .25 hours, and a standard deviation of .05 hours), the Sales calls take about 6 minutes (use a Triangular Distribution with a minimum of .05, mode of .1, and maximum of .2 hours). It is assumed that all Sales calls are for placing sales calls. The departments are staffed with 3 customer service (at $15 per hour) and 4 sales representatives (at $12 per hour).

The purpose of this SIMPROCESS exercise is to build a model of the call service process and analyze the performance measures of the process. Specifically, the performance measures of interest are total processing time, wait time, resource utilization, and activity costs.

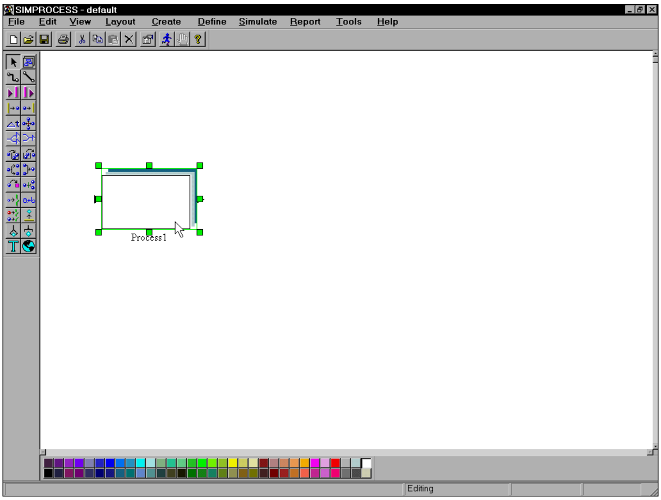
Creating the Process Model

Creating your first SIMPROCESS model involves three simple steps:

- Mapping the Process
- Defining the Activities and Workflow
- Defining the Resources and Their Usage

Mapping the Process

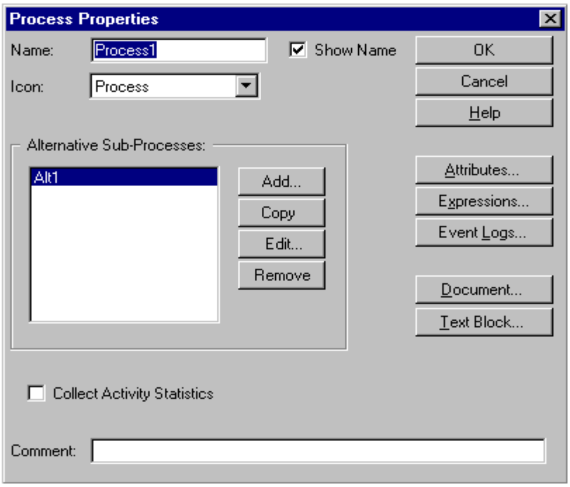
As mentioned in Chapter 1, SIMPROCESS is the first hierarchical modeling tool that combines process mapping with simulation. Let us begin our tutorial by mapping the call service process. Let us first define three major processes, namely, Generate Calls, Process Calls, and Complete Calls. To define the first major process, simply click on the Hierarchical Process icon in the palette (the uppermost icon on the palette, next to the pointer), drag the mouse, and drop it on the layout. Notice that SIMPROCESS assigns a default name called Process1 for the object you placed on the layout. Also, notice that each process box has one input and one output pad. You will later use these pads as the connection points between the processes.



Once you have placed the Process icon on the layout, you can size it, move it, and even cut and paste it. Now, let us define the name of this process as “Generate Calls.” To accomplish this task, you need to bring up the Properties dialog for this object. There are three ways to bring up the properties dialog of a hierarchical process that has been selected:

1. Click on the Properties button in the tool bar (the button next to the Clear tool),
2. Choose the **Edit/Properties** option from the main menu
3. Press **Alt-<Enter>**.

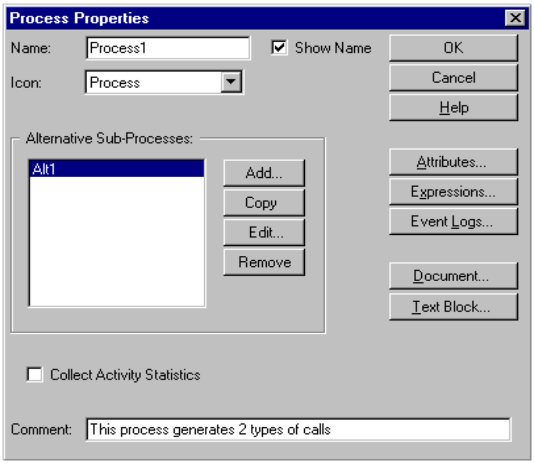
Let us click on the Properties button to bring up the dialog box.



The process **Name** field contains the default name, "Process1," that is displayed below the process box in the layout. You can change this name or disable it by unclicking the **Show Name** option. For now, let us leave it as is.

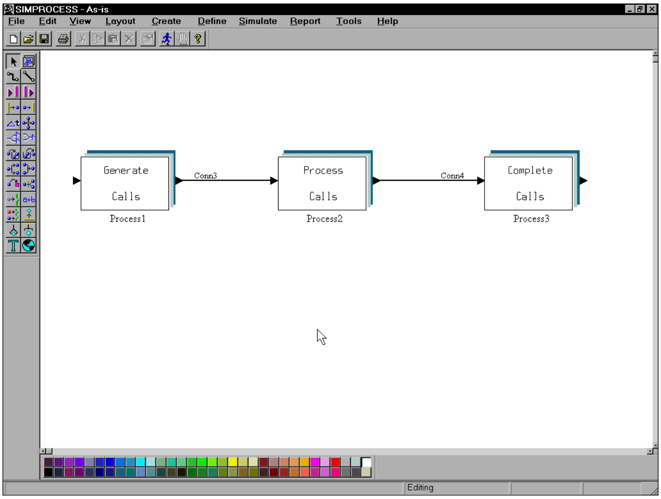
In addition to this **Name**, you can display text inside the process box graphic on the layout. To accomplish this task, click on the **Text Block…** button. This brings up the dialog in which you can type in `Generate Calls`, the name of the first process.

Notice that you can choose another icon besides the default box graphic to represent a process. For now, let us use the default box graphic. One of the useful process documentation features of SIMPROCESS is the **Comment** field in the Properties dialog. For this process, let us type in `This process generates 2 types of calls`. Then click **OK** to accept the input and close this dialog box.



To define the second process, click on the Process icon from the palette and drop the process to the right of the first process in the layout. Then, click on the **Properties** button in the tool bar to bring up the Properties dialog. Let us label this process by clicking on the **Text Block...** and typing in `Process Calls`. In the **Comment** field, type in `AS-IS Process with 3 Service and 4 Sales Reps`. You will create a TO-BE alternative of this process in the next chapter.

To define the third process, place it on the right-hand side of the layout, repeat the steps described above, and label it `Complete Calls`. You now have three processes in your layout.

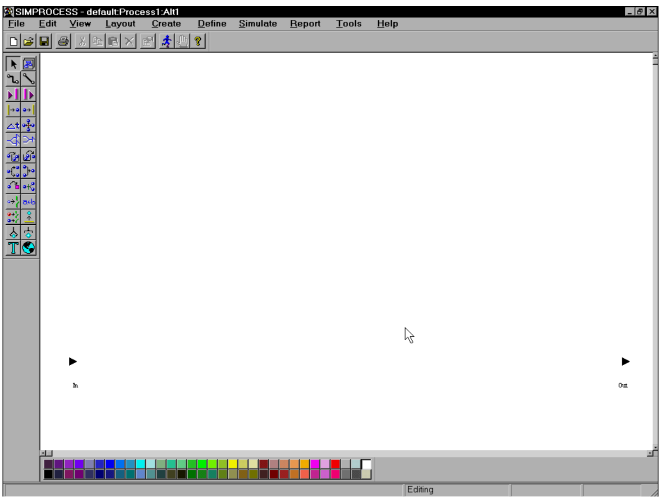


Next, let us define the workflow by connecting the three processes using the Connector tool from the palette. Note that SIMPROCESS gives you two types of connectors. One type is a straight connector (diagonal button) and the other type is a bent connector. For this tutorial, let us use the bent connectors. First, let us connect the Generate Calls to Process Calls. Select the “connector” tool from the palette and click on the right-hand side of the Generate Calls process. Then, drag the mouse to the left side of the Process Calls process and click again. When you release the mouse button, the connector between the two processes will appear. Repeat this task to connect the Process Calls process to the Complete Calls process. (A helpful hint for Windows users: if you hold the **Shift** key down while drawing the connectors, you are in “extended select” mode. This means you can continue to draw connectors without having to repeatedly go back to the palette. This can be done with any palette item that you wish to use repeatedly.) When you are done, your model should look like the figure above.

As you can see, mapping your process with SIMPROCESS is as quick and simple as flowcharting! While

SIMPROCESS gives you the benefits of flow diagramming, it also provides you with the benefits of object-oriented simulation. The three processes that you just placed on the layout during the process mapping step are hierarchical objects. You can drill down inside each process and define its sub-processes. Unlike the attached diagram relationships in flowcharting based simulation tools, in SIMPROCESS, the relationships between hierarchical processes are based on object oriented modeling. In other words, the sub-processes not only inherit the graphical symbols of the hierarchical process but also their behavior. This provides the major benefit of reusability.

In this tutorial, you will drill down one level within each process; however, there is no limit to the number of levels you can drill down. To practice drilling down, simply select a process and double-click on it. Notice that you have a new layout with an input pad on the left-hand side and output pad on the right-hand side of the layout. Also notice that SIMPROCESS keeps you informed as to where you are in the hierarchy by displaying the name of the parent process object for this current layer.

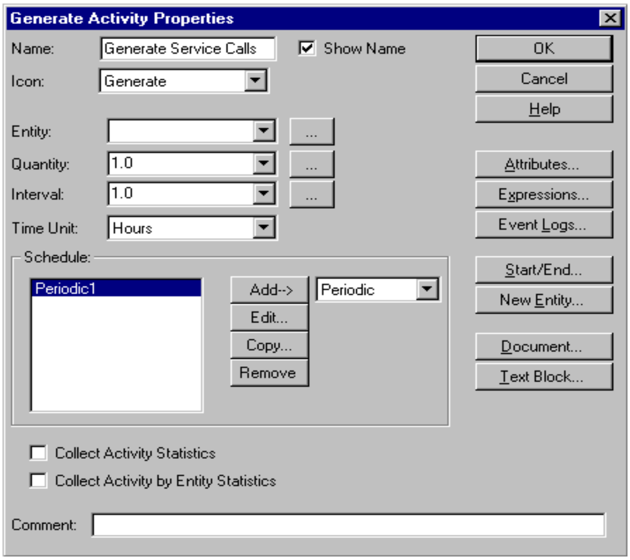


To get back up, simply double-click any blank space on the layout. You can also accomplish the same task by choosing the **View/Ascend** from the main menu bar. Now, you are ready to create a hierarchical simulation model of your process by using the powerful activity-based modeling and resource modeling constructs.

Defining the Activities and Workflow

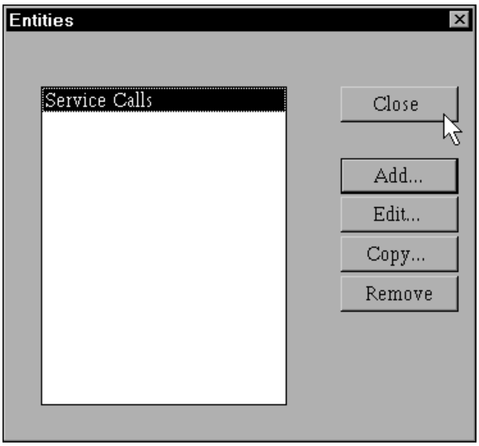
At the lowest level of each hierarchical process object is an activity or activities that describe the behavior of that process. In this tutorial, you will define two GENERATE activities that describe the process called Generate Calls. You will define a BRANCH activity followed by two DELAY activities that describe the process called Process Calls. Finally, you will define a DISPOSE activity that describes the process called Complete Calls.

GENERATE Activities — The entities (or flow objects) that will be moving through your model are created with GENERATE activities. The first process in your model generates two types of calls. Let us drill down inside the Generate Calls process by selecting that object and double-clicking on it. Since this particular process is the beginning of the tutorial exercise, you need not be concerned about the input pad. First, let us define the GENERATE activity that generates the service calls. To do this, select the GENERATE activity tool from the palette and place it on the layout. Then, double-click on the graphic to get the dialog box.



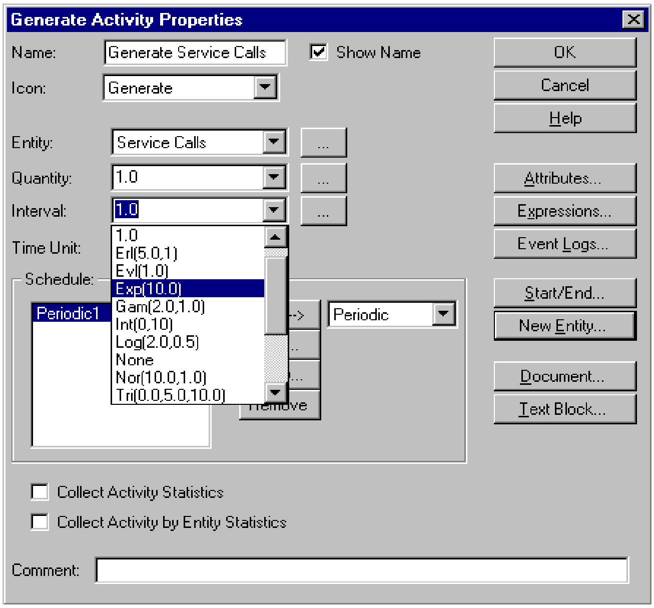
Let us change the name of this activity to `Generate Service Calls`.

Next, click on the **New Entity** button to define the service calls. This brings up the dialog that allows you to define new entities.



Select the **Add** option, type in the name `Service Calls`, and click on **OK**. Notice that the name `Service Calls` appears in the **Entity** field. This field is a list box that contains the names of all entities that are defined in the model.

Now, you are ready to define the interval between service calls. In this simple model, we will represent the time between customer service calls using an Exponential distribution. To define the Interval for service calls, click on the down-arrow next to the **Interval** combo box to see the list of available statistical distributions. Select the Exponential distribution, that is, Exp(10.0).

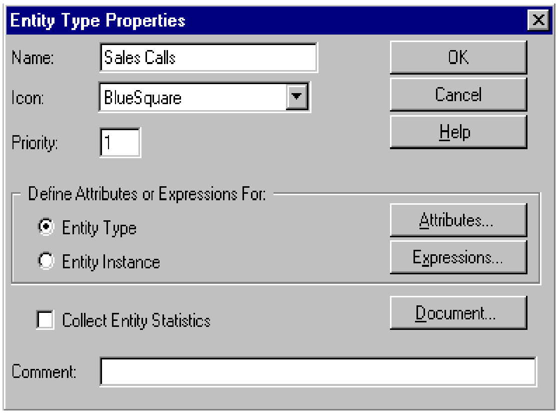


You will see Exp (10.0) in the distribution field where 10 is the default value for the mean. To change the mean value for the interval to 0.1, click on the **Interval** detail button (the button with three dots on it). Let us do that and type `6` (minutes) in the **Mean** field. Click on **OK** to complete the distribution selection. You can also edit the **Mean** field by editing the distribution field directly. Select Minutes as the **Time Unit**.

The default value for generation of calls in the **Quantity** field is 1, which is what you want for this model. Notice that the GENERATE activity gives you many other options. For example, you can use a data file to generate the calls instead of a statistical distribution. Or, you can create complex schedules and cyclical arrival patterns. For now, let us click on **OK** and move on to defining the generation of sales calls.

To define the generation of sales calls, select a GENERATE activity again from the palette and place it on the layout below the first GENERATE activity. Then, double-click on its graphic to reach its Properties dialog box. Let us change the name of this activity to “Generate Sales calls.”

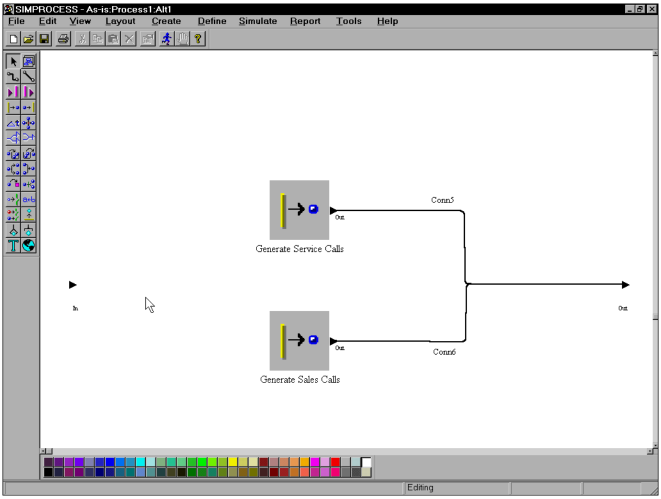
Next, click on the **New Entity** button to define the sales calls the same way we did for Service Calls. This brings up the dialog that allows you to define new entities or edit existing ones. Select the **Add** option, type in the name `Sales Calls`. Choose an icon for the Sales Calls from the **Icon** combo box, that is different than the one you used for the Service Calls. When you view the animation during the simulation run, we will be able to see which calls moving through the system are Sales Calls and which are Service Calls.



Click on **OK** to close the Entity Type Properties dialog. The name `Service Calls` is displayed in the **Entity** field of the Generate Sales Calls activity. To change it to `Sales Calls`, click on the down-arrow to see the **Entity** list and select `Sales Calls` from the **Entity** list. Now, you are ready to define the interval between Sales Calls. To define the **Interval**, click on the down-arrow to the right of the **Interval** combo box to see the list of available statistical distributions. Select the Exponential distribution again. Click on the **Interval** detail button and type 3 (every 3 minutes) in the **Mean** field as the mean value for the distribution. Before closing the dialog box for the Exponential distribution, click on the **View** button in the lower right-hand corner. SIMPROCESS provides you with this useful viewing facility so that you can visualize the probability density function for this distribution. When you are done viewing the curve, close that window and click on **OK** to return to the dialog box for the GENERATE activity. Select Minutes for the **Time Unit**, and click on **OK** again to get back to the layout.

At this point, you must do an important task to complete the description of the call generation process. That is, you must connect the output pads of the two GENERATE activities to the output pad of the hierarchical process called Generate Calls. To accomplish this task, first select the connector tool from the palette and connect the output pad of the Generate

Service Calls activity to the output pad on the right-hand side of the layout. Then, repeat the same task by connecting the output pad of the Generate Sales calls activity to the output pad of on the right-hand side of the layout.

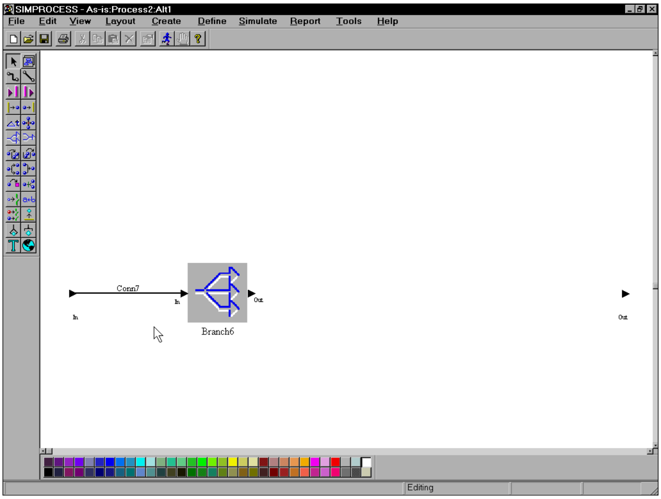


Now, we are done describing the processes for the Call Generation process. Double-click on any blank area on the layout and get back up to the major process level of the hierarchy.

Next, you will define the Process Calls process which consists of a BRANCH activity followed by two DELAY activities. To drill down inside the Process Calls process, select that process with the mouse and double-click on it. Notice that SIMPROCESS gives you an input pad on the left-hand side, an output pad on the right-hand side and a blank layout in the middle for placing the activities at this level.

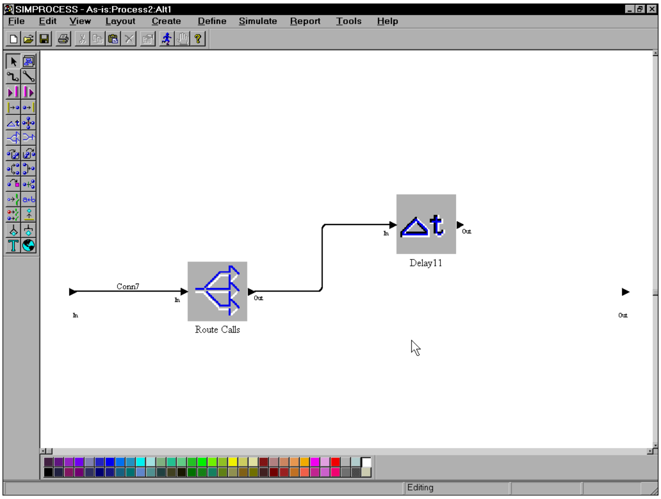
The Branch activity determines the routing of calls. From the palette, select the Branch activity and place it to the right of the input pad. Then, using the connector tool connect the process input pad to the input pad of the

BRANCH activity. This means that calls entering the Process Calls process will be the input to this branching activity.



Then, double-click on the BRANCH activity icon to get its Properties dialog box. Let us change the name of this activity to `Route Calls`. By default, the branch type is set to **Probability**. Change this setting by selecting the **Entity Type** button and select **OK** to close this dialog box.

The DELAY activities represent the Customer Service and Sales activities. From the palette, select a DELAY activity and place it to the right of the BRANCH activity. Then, select the connector tool and connect the BRANCH activity to this DELAY activity.



To specify which entities take this route, you need to double-click on the connector between the Branch and Delay activities. Inside the Branch Connector Properties dialog, the currently displayed **Entity Type** is the `Service Calls`. To display the name `Service Calls` in the layout, type it in the **Name** field and check the **Show Name** box. Click on **OK** to close this dialog box.

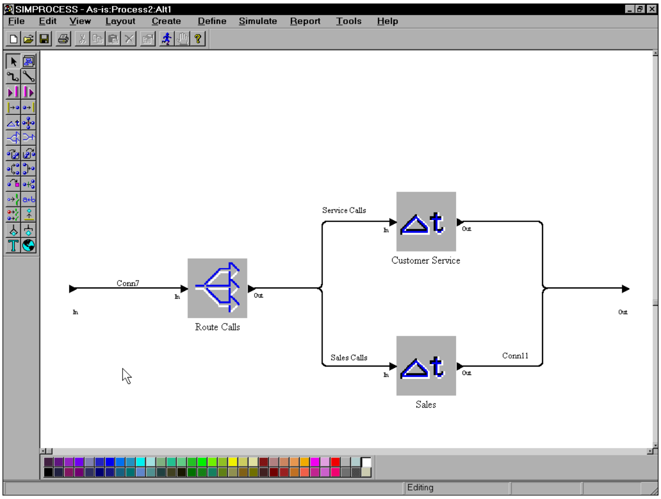
Next, double-click on the DELAY activity graphic to define its properties. Let us change the name of this activity to `Customer Service` and define the duration for servicing a Customer Service call. The **Duration** field is a combo box much like the **Interval** field in the GENERATE activity. To define the duration, click on the down-arrow next to the combo box and select the Normal distribution (Nor). Then, define the parameters of the distribution (`15` for the mean and `3` for the standard deviation). Again select `Minutes` for the **Time Unit**. Notice that one of the buttons in the Delay Properties dialog box is for defining resources required for this activity. You will do that after completing the workflow definition.

Next, you need to define the DELAY activity representing the servicing of the Sales Calls the same way we did for Customer Service. To do this task, select the DELAY activity from the palette and place it to the right of the BRANCH activity just below the Customer Service activity. Then, select the connector tool and connect the BRANCH activity to this DELAY activity.

To specify which entities take this route, double-click on the connector and select the “Sales Calls” entity from the list of **Entity Types**. Then, type in the name `Sales Calls` in the **Connector Name** field and make sure the **Show Name** box is checked. This feature provides for meaningful documentation of the workflow. Click on **OK** to close this dialog box.

Next, double-click on the DELAY activity graphic to define its properties. Let us change the **Name** of this activity to `Sales` and define the duration for servicing a sales call (triangular distribution, i.e., TRI, with a minimum of `3`, mode of `6`, and maximum of `12`). Make sure to select `Minutes` as the **Time Unit**.

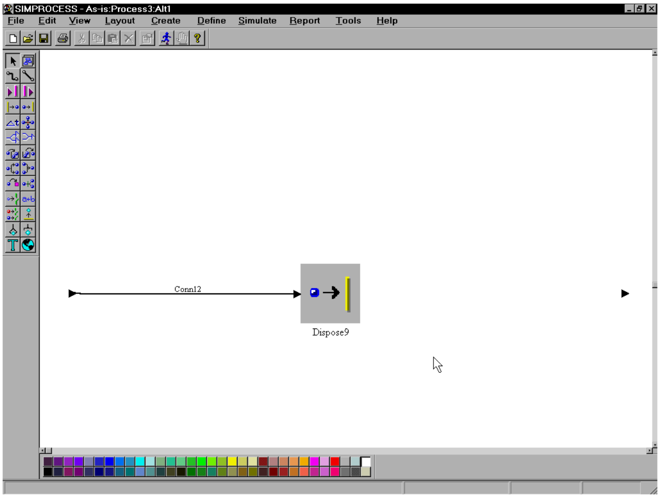
To complete the description of the activities at this level, you need to connect the output pads of the Customer Service and Sales activities to the output pad that is on the right-hand side of the layout. At this point, the layout of your process should look something like the following figure.



When you are done with those connections, you can get back to the major process level by double-clicking in any blank space in the layout.

The final task for completing the workflow is to describe the completion of calls. To accomplish this task, double-click on the hierarchical process named Complete Calls.

This activity is used for disposing of the calls after they are serviced. That is why the DISPOSE activity only has an input pad. For now, you need not define any parameters for this activity. Just select the DISPOSE activity from the palette, and drag and drop it in-between the two pads. Then, using the connector tool, connect the input pad of the hierarchical process to the left side of the DISPOSE. When you are done making this connection, simply double-click in any blank space on the layout and go back up to the major process level.

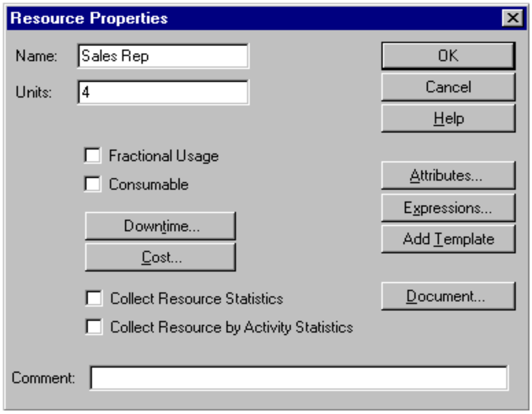


At this point, you are through with the definition of your processes, activities and workflow. You are now ready to define your resources and where they are required to perform work.

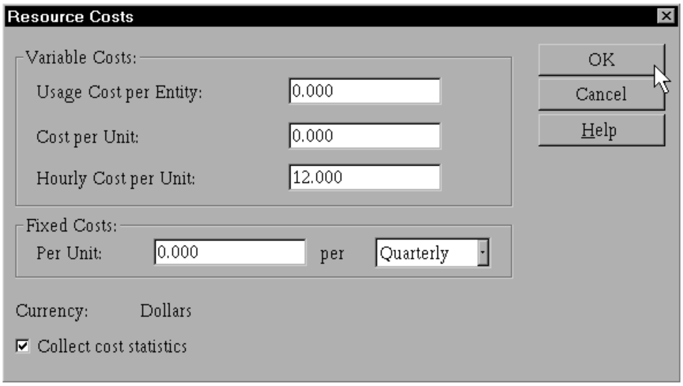
Defining the Resources and their Usage

One of the most powerful constructs of SIMPROCESS are the Resources. In this tutorial, you will define the Customer Service and Sales resources, their capacity (quantity available) and hourly labor costs. You will then assign them to the appropriate activities.

Resources are defined under the main menu option called **Define**. Selecting the **Resources** option brings up the **Resources** list box. To define a resource, click on the **Add** button, type in the **Name** `Sales Rep` and define **Units** as `4`.



To define the hourly labor rate, click on the **Cost** button and type `12` in the field called **Hourly Cost per Unit**. This means that each representative costs $12 an hour. During the simulation, SIMPROCESS will calculate the activity costs based the actual usage of the sales representatives. Then, click on the **OK** button to complete defining the Sales Representative resources.



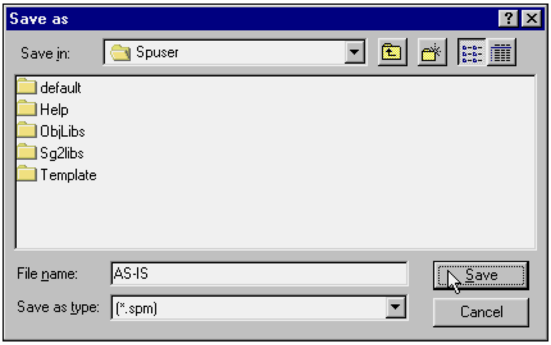
To define the Service Reps, click on the **Add** button of the **Resources** list box and repeat the same steps while setting the **Units** to `3` and the **Hourly Labor Rate** to `$15`. When you are done defining the Service Reps, click on the **OK** button. Then, click on the **Close** button of the **Resources** list box to get back to the layout.

Now, you are ready to define how these resources are used in processing calls. This task is accomplished by going into the activities that use the resources. So, double-click on the hierarchical process named Process Calls and drill down to the lower level. First, let us assign the Sales Reps to the Sales activity by double-clicking on the DELAY activity representing Sales. While in the Sales activity dialog, click on the **Resources** button.

To define the resource requirements for this activity, first click on the combo box to see the list of resources that you have defined. Select the `Sales Reps` resource and click on **Add Resource**, leaving `1` as the default for the **Usage Rate**. This means one Sales Representative is required to perform this activity every time a Sales Call comes in. During the simulation, when a call arrives it will be serviced by one of the four Sales Representatives. If all Sales Representatives are busy, then the caller will wait in a queue until the next representative becomes available. SIMPROCESS will automatically keep track of the number of calls waiting, as well as how much time each call waited. Click on **OK** to close the dialog box.

To define the usage of the Customer Service representatives, select the “Customer Service” activity and repeat the same steps, again assigning one representative to each call that enters the activity. When you are done assigning the resources to their corresponding activities, you are ready to simulate the process.

Save the model now, before running the simulation. To save your model, select the **Save** option under the **File** menu. Then, type in `AS-IS` in the field next to **File Name**.



Note that the file extension for SIMPROCESS models, `.spm` is automatically assigned. So, your model file will be saved as `AS-IS.spm`. Now, you are ready to simulate your process!

Simulating the Process

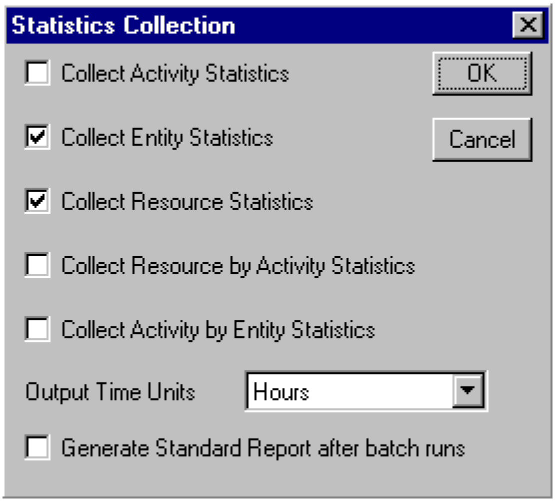
Once you have completed building your model, simulating your process model involves three simple steps:

1. Defining the Statistics Collection
2. Defining the Run Settings
3. Running the Simulation.

1. Defining the Statistics Collection

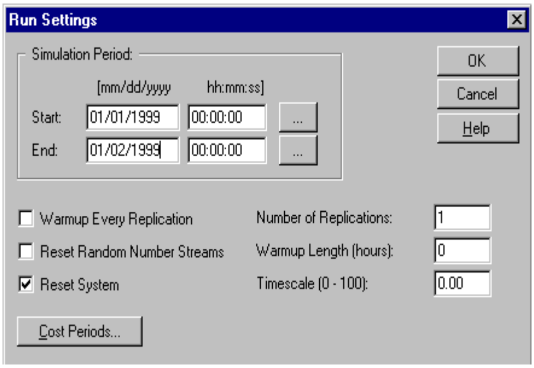
Before running the simulation, we need to define what statistics we wish SIMPROCESS to gather for us. SIMPROCESS provides you with a very flexible report generating system. As mentioned in the model description and objectives, the performance measures that we are most interested in are total processing time, wait time, resource utilization and activity costs.

From the **Report** menu, select the **Define Global Statistics Collection** option. **Collect Entity Statistics** and **Collect Resource Statistics** should already be checked. If not, then select them. These are the default statistics collected by SIMPROCESS. When using this menu it is not necessary to individually request statistics for entities, resources, and activities.



2. Defining the Run Settings

The next step before running the simulation is to specify how long we want to simulate the process. To do this, select **Simulate** from the main menu, and then the **Run Settings** option. This will bring up the Run Settings parameters dialog box. The default **Start** date is “01/01/1999.” For now, leave the **Start** date as the default date and time. Change the **End** date to “01/02/1999.” This means SIMPROCESS will simulate the model for 1 day (24 hours) and report statistics over that time. Click on **OK** to close the dialog and accept the inputs.



Running the Simulation

Now, you are ready to run the simulation. You can do this by clicking on the runner graphic on the tool bar, selecting the **Simulate/Run** option from the main menu, or by pressing the **F4** key.

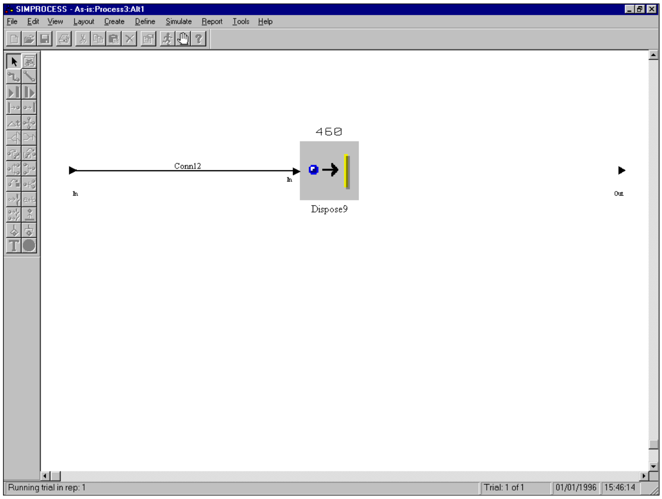
When the simulation starts running, SIMPROCESS gives an animated picture of the workflow.

Animation is an extremely powerful tool for verifying your model and visualizing your process in motion.

During the simulation, you will see the simulation clock on the lower right-hand corner of your screen. As the process is simulated, SIMPROCESS dynamically updates the counters above the processes and activities. At the top level of your model is the animation of the three hierarchical processes. Let us double-click on the Generate Calls process to see the animation of its detail. The counters that are above the Generate activities display the number of entities generated so far.

Next, double-click on any blank space and back up to the top level. To watch the animation of the customer service and sales activities, drill down into the Process Calls object. The counters above the Branch and Delay activities show the number of entities currently in process.

Now, move back up to the top level and descend into the Complete Calls process. The counters above the DISPOSE activity display the number of entities processed so far. In this model, because both types of calls are sent to the same DISPOSE activity, the counter displays the total number of calls. In addition to these counters, you can display real-time graphs of cycle times, counts, and the number of calls waiting for service.



Animation can be turned off anytime to speed up the execution of the simulation. This can be accomplished by selecting the **Animation Off** from the **Simulation** menu. While the simulation is in progress, notice that the status bar in the bottom of your screen displays “Trial: 1 of 1.” When the simulation is over, you will notice that the status bar displays the message “Editing.” Once the process simulation is complete, you are ready to analyze the output reports.

Analyze the Performance Measures

Analyzing the performance measures for this model involves two simple steps:

- Displaying the Standard Report
- Displaying the Activity Cost Reports

Displaying the Standard Report

To bring up the Standard Report, select the **Report/ Display Standard Report** option from the main menu. Then, select `Replication 1` and click **Display Reports**.

First, we will look at "Entity: Total Count - Observation Based." This gives you the values of 469 for sales calls processed and 247 for customer service calls processed.

"Entity: Cycle Time (in Hours) By State" shows that the average total processing time for a Sales call was about .12 hours (7.2 minutes), while the total processing time for a Customer Service call took about .43 hours (26 minutes). These times include the actual time for a call (in process time) plus the wait time. The average wait times are .005 (.3 minutes) for Sales calls and .182 (10.9 minutes) for service calls.

Although the average wait time for sales calls is acceptable, an average wait time for customer service calls seems too long. An important question that comes to mind is "If the average wait time was 10.9 minutes, what was the maximum wait time for a customer service call?"

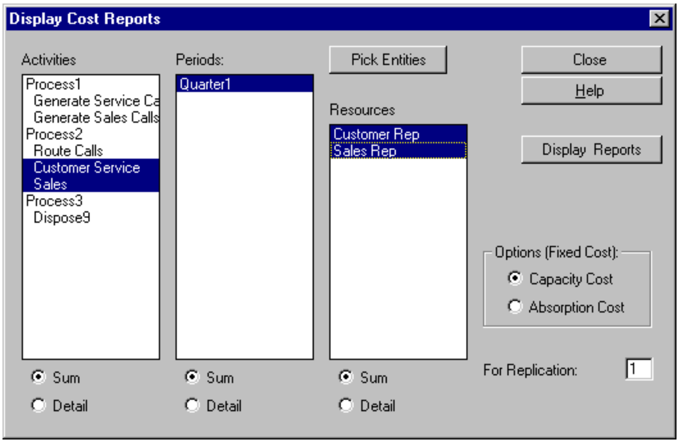
The maximum wait times were .085(5.1 minutes) for sales and .872 (52.3 minutes) for customer service calls. This means, of the 469 sales calls, the one that waited the longest had to wait 5.1 minutes and of the 247 customer service calls, the one that waited the longest had to wait about 52 minutes.

Is this acceptable? For any mail order business that wants to be competitive, the answer is "Of course not." No customer would wait 52 minutes before getting serviced. Most likely, they will hang up and try again. Or, they will take their business somewhere else. In the next chapter, you will create the TO-BE process to reduce the maximum wait time for customer service calls. Now, we will look at the resource statistics.

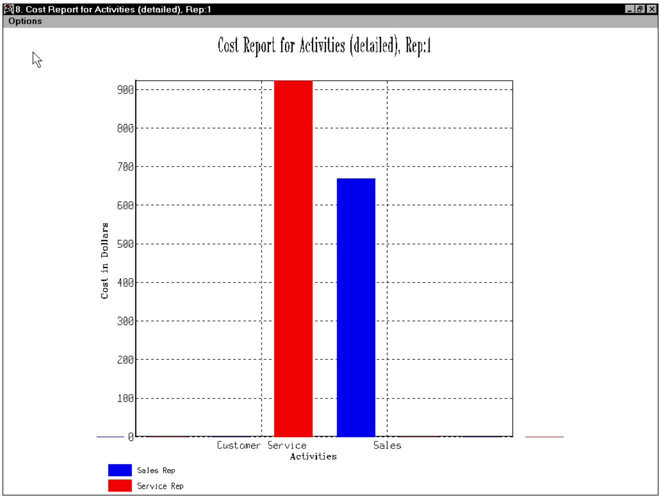
"Resource: Number of Units By State" shows that average utilization of the Customer Service Representatives and Sales Representatives was over 2. Considering the fact that there were 4 Sales Reps and 3 Customer Service Reps available, this points out the possibility of overstaffing in the sales department. However, you need to keep in mind that wait times were minimal for sales calls while they were considerable for customer service calls. If you were to reduce the sales staff to 3 units, what would happen to wait times for sales calls? You may want to try this alternative on your own after completing this tutorial.

Displaying the Activity Cost Reports

To bring up the Cost reports, select the **Display ABC Reports/Activities** from the main menu. First, select the `Customer Service` and `Sales` from the **Activities** list box, and then click on the `Quarter 1` under the **Periods** list box.



Notice the two types of **Resources**, namely, `Service Reps` and `Sales Reps` are already highlighted. Below each list box are two radio buttons in this dialog. Selecting **Sum** gives you the total cost for all the highlighted activities, while **Detail** gives you costs by activities. The default settings are set to **Sum**. Click on the **Detail** buttons below the **Activities** and **Resources** list boxes so that you can display detailed activity costs for both the Customer Service and Sales representatives. To bring up the Activity Cost Reports, click on the **Display Reports** button.



Let us review these statistics by maximizing this window. Since you only ran the simulation for 24 hours, this means the costs were calculated for the 24 hour simulation run within the first quarter (3 months). To see the exact values for activity costs, select **Show Data** from the **Options** menu. You will see that the activity costs are $669 for Sales and $922 for Customer Service activities. The proper interpretation of these costs is as follows: It cost $669 to service 469 sales calls and $922 to service 247 customer service calls. This adds up a total of $1,591 for serving 716 phone calls.

We can now close our Report Display dialog by clicking on the **Close** button. This action leaves the windows containing the bar charts open so that you can compare the results of this AS-IS business process to the results of the TO-BE process which is described in the next chapter.

Important Note: Please note that this simple exercise is intended to provide you with an overview of SIMPROCESS. In a typical business process simulation project, you would need to run this model for a longer duration and for multiple replications before making conclusions about the results.

CHAPTER 4

Evaluating Alternatives With SIMPROCESS

This chapter shows you how to create and evaluate alternatives with SIMPROCESS. The purpose of this chapter is twofold: 1) to familiarize you with the unique process analysis feature Alternative Sub-processes, and 2) to improve the process that you modeled in the first tutorial. First, a description of the TO-BE Process and tutorial objectives is given. Then, a step-by-step tutorial is provided.

The TO-BE Process Description and Tutorial Objectives

In this tutorial exercise, you will create a TO-BE alternative of the hierarchical process named “Process Calls” for the mail order business model developed in the previous tutorial. The TO-BE alternative process uses customer representatives that are trained to process both the customer service calls and sales calls. So, instead of sales reps being dedicated to the sales activity and service reps being dedicated to the customer service activity, the new resources named “Customer Reps” will be flexible to service all calls coming to the Mail Order Business. The hourly cost for each customer rep is $15.

The purpose of this SIMPROCESS exercise is to evaluate the process improvements that can be achieved by cross-training the service and sales representatives. Specifically, the objective is to reduce the maximum wait time for customer service calls from 52 minutes to under 8 minutes (.13 hour) while keeping the activity costs under $1,800 per 24 hours. Decision variables that you will tweak to meet the business objectives are the Units of Resources and the Hourly Cost per Unit.

Create the TO-BE Alternative

Creating the TO-BE alternative involves three simple steps:

1. Define a new resource type called “Customer Rep”.
2. Define the TO-BE alternative subprocess for the process called “Process Calls”.
3. Save the model under the name “TO-BE,” and run the simulation.

Defining the New Customer Representative Resource

From the main menu, choose the **Define/Resources** option. This brings up the **Resources** list box. To define the new resource, click on the **Add** button, type in the name `Customer Rep` and specify the **Units** as `7`. To define the hourly labor rate, click on the **Cost** button and type in `15` in the **Hourly cost per unit** field.

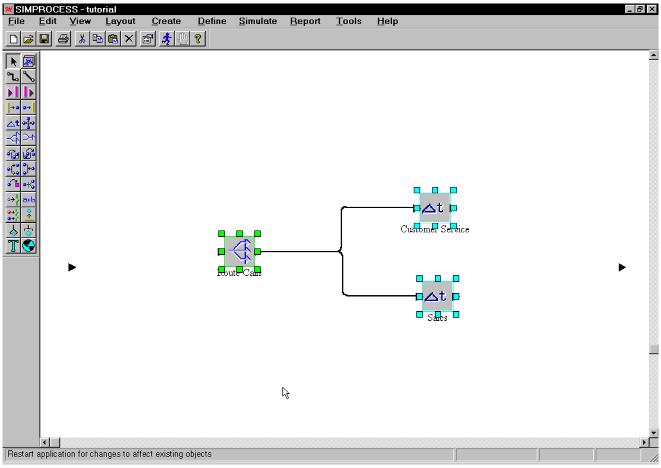
When you are done defining the cost for the new resource, click on the **OK** buttons and then the **Close** button until you are back to the layout.

Creating the TO-BE Alternative Process

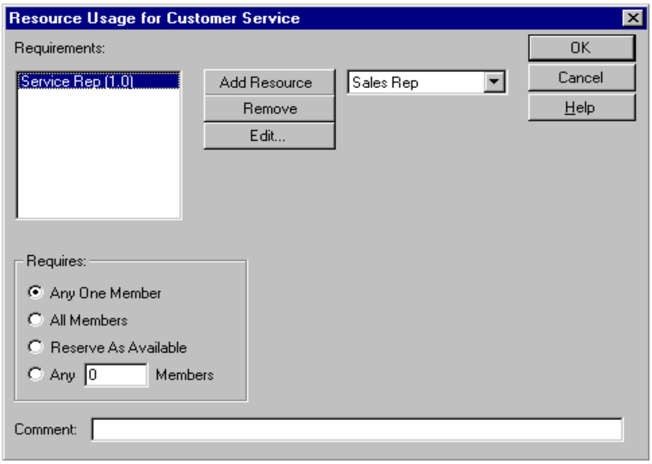
Select the process labeled “Process Calls” in the layout and double-click on it to drill down to the activity level. Then, choose the **Edit/Select All** option from the main menu. This action highlights all of the activities in the layout. Then, choose the **Edit/Copy** option from the main menu (or press **Ctrl+C**). This action copies the contents of the objects into the clipboard. Later on in this exercise, you will paste these contents into the new alternative called TO-BE. This will save you time in creating the TO-BE alternative. To get back up to the major process level, double-click on any blank space in the layout.

Next, select “Process Calls” and click on the **Properties** tool to bring up the dialog for this process. Notice that the list box contains the name `Alt1` in the **Alternatives** list box. Click on the **Add** button and type in the name “TO-BE” for the new alternative you are about to create. Then, click on **OK**. Notice that the new alternative is highlighted, meaning you are about to define its contents. So, click on **OK** and close the Properties dialog.

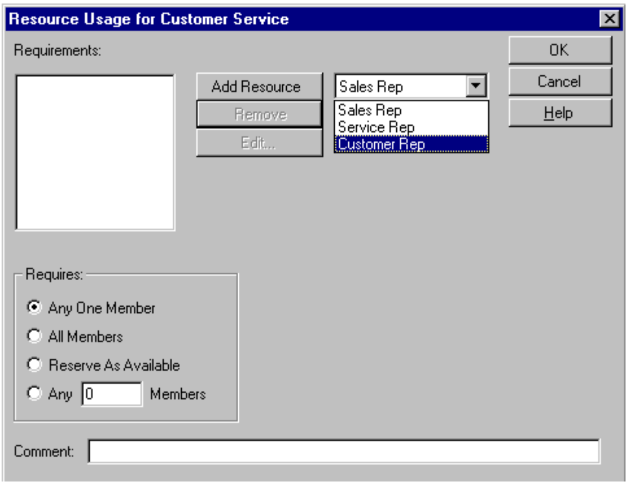
You are now ready to define the sub-processes for the TO-BE alternative of the “Process Calls” object. Double-click on the process box to drill down to the next level in the hierarchy. At this point, the layout is blank with an input pad on the left and an output pad on the right. Remember that you had copied the contents of the AS-IS process into the clipboard. To paste them, simply choose the **Edit/ Paste** option from the main menu (or press **Ctrl+V**). This action gives you a rectangle that you need to position in the middle of the layout and click to paste it. Go ahead and do that so you can now see the three activities, namely, Route Calls, Customer Service, and Sales, in the layout.



Next, you modify the resource assignments so that the resources used for performing work are the new "Customer Reps". Let us first double-click on the Customer Service activity and click on the **Resources** button to bring up the Resource Usage dialog.



To remove the Service Rep resource from this assignment, simply click on the **Remove** button while that resource is highlighted. Then, select the `Customer Rep` resource from the list box and click on the **Add Resource** button. This means that every service call will be handled by a Customer Rep instead. Click on the **OK** buttons to close these dialogs and get back to the layout.



You also need to assign the Customer Reps to the Sales activity. To accomplish this task, repeat the same steps by removing the Sales Reps from the assignment and adding the Customer Reps to the resource assignment.

The final step in completing the TO-BE process definition are to connect the input pad of the hierarchical process to the input pad of the BRANCH activity and to connect the output pads of the Customer Service and Sales activities to the output pad of the hierarchical process. You are now done creating the TO-BE alternative process. So, double-click in any blank space in the layout and get back to the major process level.

Simulate the TO-BE Process

Go ahead and save the model now as `TO-BE` using **File/Save As** from the main menu. The reports selections for the AS-IS model have been copied to our new, TO-BE, model. The only change we need to make to the report selections is to gather statistics on the new resource we added to the model, the Customer Rep. Select **Report/Define Reports/Resources** from the main menu. At the Define Reports dialog box, turn on the **Avg Units by State** report for the Customer Rep. Add the report and select **Close** to return to the main screen.

You are now ready to simulate the TO-BE alternative process. So, go ahead and select the **Simulate/Run** option (or click on the Runner icon in the tool bar). Since you did not change the AS-IS alternative, it is still part of this model. However, when you run the simulation, SIMPROCESS will only simulate the TO-BE alternative because that was the highlighted alternative when you left the Properties dialog of the “Process Calls” object. During the simulation of this alternative, double-click on the “Process Calls” hierarchical object to view the animation of the activity level. You may also turn off the animation by choosing the **Simulate/Animation Settings**. When the simulation is completed, you will see that the Status Bar displays the message “Editing” indicating that

SIMPROCESS is ready for you to edit or analyze the results.

Analyze the Results of the TO-BE Process

Now, let us display the Standard Report.

First, take a look at "Entity: Total Count". This table shows that the redesigned process with seven flexible Customer Reps serviced 467 sales calls and 254 customer service calls.

Next, look at "Entity: Cycle Time (in Hours) By State" and analyze the wait time reduction for the TO-BE process. This report shows that the average wait time for Sales calls was .008 (.48 minutes) and for Service calls was .008 (.48 minutes) indicating that the wait time for service calls was reduced dramatically. The maximum values for wait times are .147 (8.8 minutes) for the sales calls and .122 (7.3 minutes) for the customer service calls. These peak wait times are much more acceptable considering the fact that only one of the 467 sales calls had to wait 8.8 minutes and only one of the 254 customer service calls had to wait 7.3 minutes.

Next, let us take a look at the cost reports. Select the **Reports/Display ABC Reports/Activities** option. Highlight the Customer Service and Sales activities and Quarter 1. Then, click on the **Detail** radio buttons below the **Activities** and **Resources** list boxes and click on the **Display Reports** button. This brings up the bar chart with two bars for costs of each activity. The customer service activity cost is $948 and sales activity cost is $829 adding up the total activity costs to $1,777. This means we were able to achieve our desired business objectives by keeping total activity costs under $1,800. Let us minimize this activity cost report window and then close the Cost Reports dialog.

Compare Performance Measures from AS-IS with TO-BE

Let us now compare the results from the AS-IS process with the TO-BE process. The table below summarizes the results:

AS-IS TO-BE Report

Sales	Customer Service	Total	
469	247	716	AS-IS Calls
467	254	721	TO-BE Calls
$669	$922	$1,591	AS-IS Activity Costs
$829	$948	$1,777	TO-BE Activity Costs

CHAPTER 5

Demonstration and Reference Models

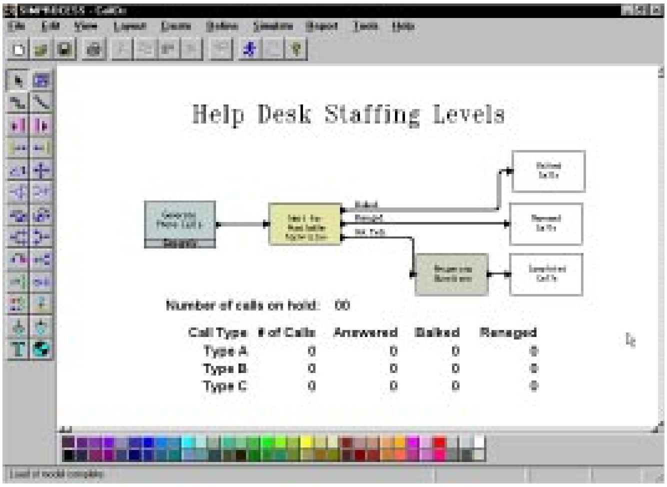
This chapter describes the demonstration and reference models that are included with your SIMPROCESS installation under the `demos` subdirectory in the `SPUSER` directory. Running these models and studying the techniques used in building them will give a better appreciation for the activity modeling and advanced modeling constructs of SIMPROCESS.

Call Center Model

(model name: CallCtr.spm)

Staffing of Call Centers has become an important issue for many companies today. Balancing staffing levels with the need to maintain the high level of service that consumers demand, requires complex analysis.

In this model, three types of calls are generated; Type A, Type B and Type C. Each call type has its own cyclical schedule, at a generate activity inside the Generate Phone Calls process.



The center is staffed by three levels of Technicians; X, Y and Z:

- Question Type A can be answered by any of the three technicians
- Question Type B can be answered by a Y or Z Technician

- Question Type C can be answered only by a Z Technician.

The numbers of each type of Technician available in the model are model parameters. Each time the simulation is started, a dialog box will open. You change any of the model parameters from that dialog.

By default, the incoming call buffer can contain no more than 10 calls on hold. If 10 callers are already on hold, the next incoming call will get a busy signal and be dropped. The maximum number of calls the buffer can hold is also a model parameter; you will be prompted to change the queue’s capacity each time the model is run.

If a call is on hold for too long (in the buffer), it will hang up (renege). The renege time for each type of call is set by a model parameter and can be changed each time the model is run.

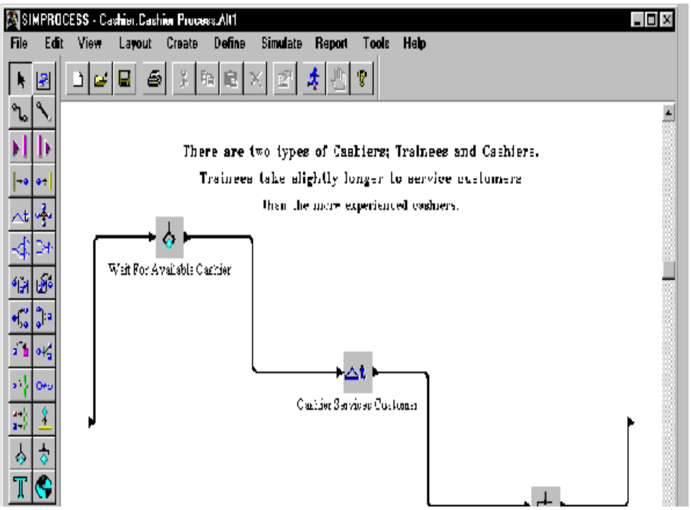
This model can be run using SIMPROCESS Lite. It was built using advanced features available in SIMPROCESS Professional.

Cashier Process Model

(model name)Cashier.spm

This model also addresses staffing issues. Many organizations want to study how experience and training programs for employees will affect the quality of service given to their customers. In this model, we are using how long the customer will wait for a cashier as the measure of customer service.

This simple model uses the Get and Free Resource activities. Two different resources are available to service the incoming customers, Cashiers and Trainees. The incoming customer will go to the first available, regardless of which of the two it is. The service time of the customer is dependent on which resource is servicing the customer. The Trainee will take slightly longer than the more experienced Cashier.



Both resources have an expression which passes a value to a global entity instance attribute called "cashier". The value passed to the attribute on the Cashier is 1.0 and on the Trainee is 1.2. This value is passed to the customer when the cashier resource becomes available. The service time is calculated by an Evaluate Function on the delay activity, "Cashier Services Customer". The function takes the value of the global entity instance attribute "Cashier" on the customer, that the customer got from the cashier resource, and multiplies it by the standard time. The time standard for servicing the customer is represented by the an exponential distribution with a mean of .2.

This model can be run using SIMPROCESS Lite, but was built using features only available in the Professional version.

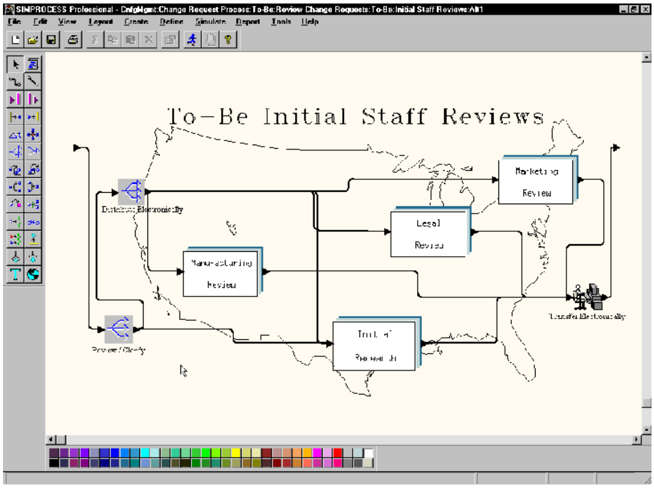
Configuration Management Model

(model name: CfgMgmt.spm)

Responding quickly to changes in the market and to customer demands requires that Product Change Requests be processed as efficiently as possible. Long delays in handling and transportation mean changes to make the product more competitive and produced more cost effectively may not implemented on a timely basis.

One strategy to decrease the time it takes to process a Product Change Request, is to use electronic means to transfer them between the various parties involved. Workflow tools are one example of an implementation of electronic transfer.

The Product Change Request Process contains two alternative sub-processes, "As-Is and "To-Be". The As-Is alternative models this process using standard mail to transport the Requests to the various parties whose input and/or approval are necessary for implementation. The To-Be alternative has essentially the same process map, with the exception that the Requests are electronically transmitted through the process.



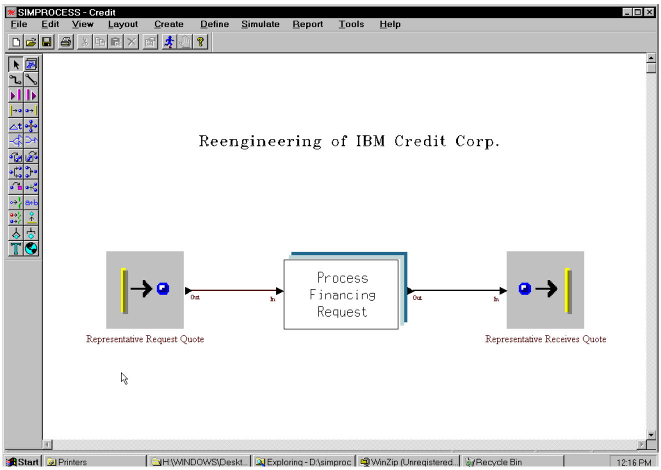
To view the two alternatives, ascend to the highest level of the model. Select the Change Request Process, and click on the **Properties** button on the toolbar. From the list of Alternative Sub-processes, select "As-Is" and the **OK** button. By double-clicking on the Change Request Process icon, you will descend into the As-Is process. To change to the To-Be alternative, ascend to the top level of the model, open the Properties dialog of the Change Request Process and select "To-Be" from the list of Alternative Sub-processes.

When the simulation is run, the output reports will reflect the currently selected sub-process.

Credit Issuance Process Model

(model name: Credit .spm)

This demonstration is a model of the IBM Credit Corporation's reengineering example that is used in Hammer and Champ's book *Reengineering the Corporation* (Harper Collins, 1993). The AS-IS process, according to Hammer and Champy, took an average of six days, and sometimes as long as two weeks. Because of this delay, customers occasionally canceled deals. When two IBM managers decided to walk through the process and determine exactly how much time was required to process a loan request, they discovered that the process took only 90 minutes! They determined (apparently) that the delays were caused by "hand-offs," or transfers between departments.



At the top level, the Credit model contains three processes. The first process is a GENERATE activity that generates finance requests based on an interval that uses an exponential distribution with a mean value of .5 hours. The second major process is a hierarchical representation of the business processes. The third process is a DISPOSE activity that marks the end of the process.

AS-IS Alternative

The AS-IS process for processing a finance request consists of five major sub-processes:

1) Log Request — Field sales personnel call in a request for financing to group of 14 people. The person taking the call (Call Logger) logs the information on a piece of paper. The paper is taken upstairs to the Credit Department by a Courier.

2) Check Credit — A Credit Specialist enters the information into a computer and does a credit check. The result of the credit check is written on a piece of paper. The Courier takes the paperwork to the Business Practices Department.

3) Add Special Terms — Standard loan contracts are modified by a Business Administrator to meet customers requirements. The request is then taken to a Pricer by the courier.

4) Price Financial Request — The pricer determines the interest rate. The interest rate is written on a piece of paper and taken to a clerical group by the courier.

5) Send Quote Letter — A quote is developed by an Administrator and sent to Field Sales via Federal Express.

TO-BE Alternative

IBM management decided to reengineer the process by replacing the specialists with “deal structurers,” or generalists. In the reengineered process, the generalists handle the process from beginning to end. To facilitate processing, the generalists would receive assistance from a sophisticated computer system and, when there was a problem, would seek help from one of the remaining specialists. IBM decided to eliminate all hand-off delays and prioritize credit application processing by assigning personnel to handle the process from beginning to end.

The TO-BE process for processing the finance request starts out with a BRANCH activity where the nature of the finance request is determined. Ninety percent of the time a request is sent to a Generalist while ten percent of the time a request is sent to a team (Deal Structuring Team). The Deal Structuring Team is defined as a Workgroup in SIMPROCESS and it consists of a Generalist, an Administrator, a Credit Specialist, a Business Practitioner and a Pricer.

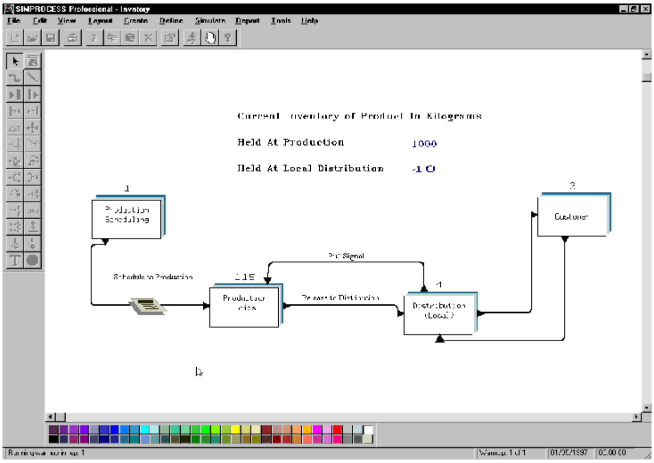
Inventory Model

(model name: Invntory.spm)

This sample model describes a system where Product is created according to a Production Schedule, and then held in inventory at the Production Facility. The Customer orders the Product, and the order is sent to Local Distribution. The order is filled at Local Distribution from inventory located there. When that inventory has been depleted, more Product is pulled from storage at the Production Facility.

NOTE: The Product entity represents 10 kilograms of actual product. This was done to simplify the model and speed-up model execution. Holding Costs and the Inventory "Scoreboard" have been scaled to represent the values for actual product.

Also, a warm-up period of 3 days has been specified to allow the system to approximately reach equilibrium before report data is gathered.



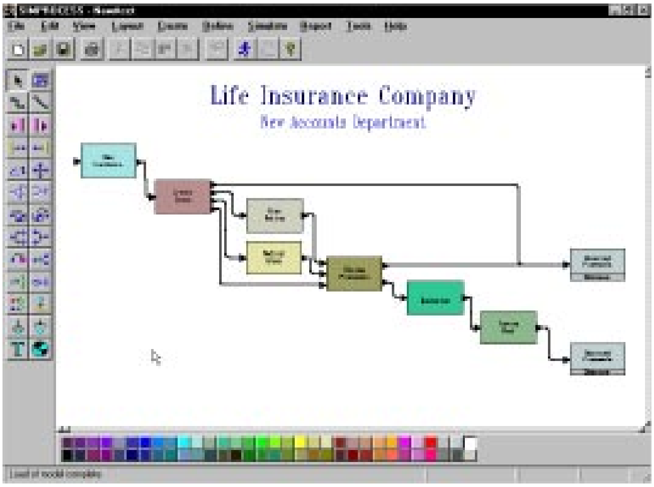
To view the output reports after running the model, from the **Report** menubar, select **Display Reports/Standard Report**. The Cycle Time, Entity Count, and Cost measures will be displayed in a text or spreadsheet format.

This model can be run using SIMPROCESS Lite. It was built using the advanced features available in SIMPROCESS Professional.

New Accounts Model

(model name: NewAcct.spm)

An insurance company is striving for higher customer satisfaction by attempting to process new requests the same day. The New Accounts Department handles new customer's requests for life insurance. This department is made up of: a credit check expert, risk rating expert, medical doctor, quotation expert and typing pool.



When a new account arrives, a Credit Check is performed. Then copies are sent to Risk Rating and Medical Check to be processed in parallel. The new account may be rejected at any of the three steps. If it passes all three, it is sent to a quotation expert, the typing pool, and then sent to the customer.

This model can be used to test how sensitive the system is to changes in staffing levels by changing the number of resources available in the model. Resources are used to model the personnel performing the work in the system, such as; Doctors, Credit Check Experts, Typing Clerks, etc.

It can also be used to test how the system will handle an increase in the number of proposals requested. If, for instance, a marketing campaign was planned that was expected to increase the number of requests by 10%, the number of incoming requests to the model could be increased by the same amount. Running the simulation again, we can see how the system's performance will be affected by the increase.

This model can be run using SIMPROCESS Lite. It was built using the advanced features available in SIMPROCESS Professional.

Supply Chain Model

(model name: Supply.spm)

For an industrial enterprise, one of the key business processes is the supply chain process. The primary goals of supply chain management are to maintain high service levels while minimizing costs. The key problem in supply chain management is how to balance inventory. Variability in demand and process times, complexity of the supply chain objects, and system dynamics create uncertainty that can only be modeled and analyzed with a tool like SIMPROCESS.

This demonstration model represents a typical supply chain for an industrial enterprise with 4 factories, 3 suppliers, and 4 customers (distributors) in the United States. This high level model of the supply chain demonstrates how SIMPROCESS can help define the major processes, resources, and entities involved in providing products to customers. The model also demonstrates the power of the hierarchical simulation capability of SIMPROCESS. To view the power of hierarchical modeling, drill down into the West Coast factory (**F1**). Below is a brief description of the model elements.

Customers

Customers demand products from the factories. The customer process defines the frequency and quantity of demand from the factories.

Suppliers

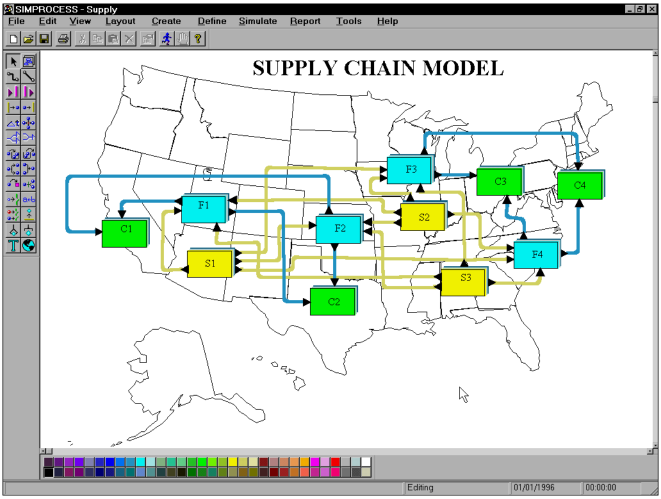
Suppliers supply raw materials (supplies or components) to the factories. Each supplier produces different types of raw materials and ships to each factory.

Factories

Factories assemble the components, package the goods (inventory) and ship them to customers. A factory typically ships to customers in its geographic region. For example, the west coast factory receives 80 percent of its orders from the west coast customer and 20 percent of its orders from the southwest customer.

Such a model of a supply chain can be enhanced to answer questions such as:

- What if the demand for certain products from the east coast supplier doubles?
- What if the west coast supplier is having manufacturing problems with a product line?
- What if we use alternative transportation carriers to deliver products to customers?
- What if we outsource the assembly process?



Product Development Process Model

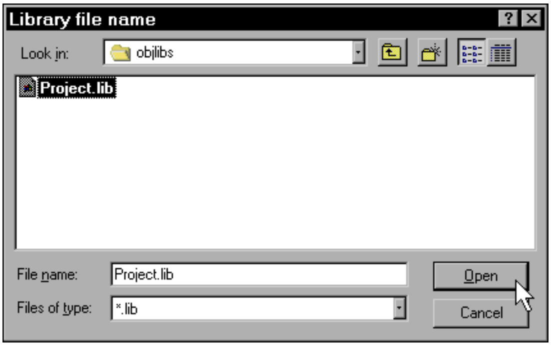
(model name: Project.spm)

Life cycles of product and services are becoming shorter and shorter. The up-front costs of developing and testing a product are not recouped until revenue is generated. Therefore, minimizing the “time to market” is a key competitive advantage for industrial enterprises.

Understanding and estimating the time and cost to complete a product development process is a key business challenge. Typically, managers have relied on project management tools. However, highly variable activity times and highly interdependent resources makes it very difficult to analyze activity costs and resource requirements without a tool like SIMPROCESS.

This demonstration model represents a typical product development process from product research and prototyping to design and testing.

This model shows one of the unique features of SIMPROCESS — reusable templates. In order to appreciate this feature, first you need to load the customized library called (`project.lib`). You can load this library by selecting the **Load Library from Disk** (under the **Define** menu).



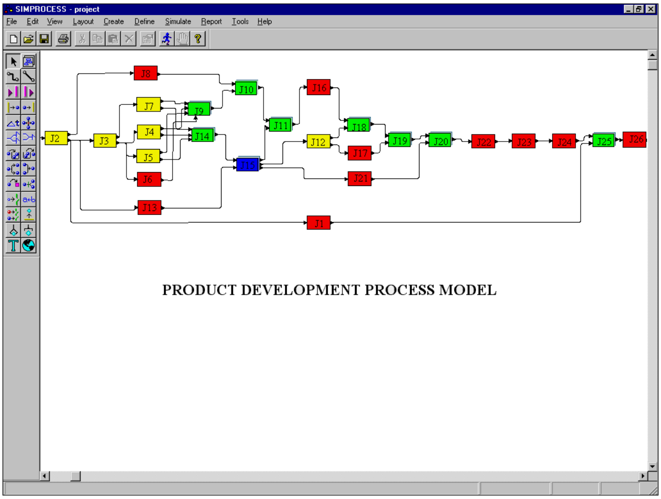
Once you load the project library, you will notice that the objects in the palette are different than the objects that are in the default SIMPROCESS library. This library is specifically designed for modeling project types of processes (like a product development process). The product development project consists of a start task, many intermediate tasks, and an end task. The color coding of the tasks indicate the predecessor and successor relationships between tasks. There are four types of such relationships. Below is a summary of the reusable templates, color codes and SIMPROCESS activity modeling constructs used for each type.

Reusable Templates

Reusable Template	Color	Activity Modeling Constructs
One predecessor One successor	Red	DELAY
One predecessor Many successors	Yellow	COPY
Many predecessor One successor	Green	SYNCHRONIZE + BATCH
Many predecessors Many successors	Blue	SYNCHRONIZE + BATCH + COPY

Five types of resources are modeled. They are:

- Design engineers (3 available)
- Prototype engineers (2 available)
- Software engineers (2 available)
- Equipment engineers (2 available)
- Test engineers (2 available)



In this model, another powerful feature of SIMPROCESS is demonstrated. This feature is resource downtime. The downtime feature shows how process variability due to interruptions can be modeled and how its impact on cycle time can be analyzed.

Purchasing Process Model

(model name: Purchas.spm)

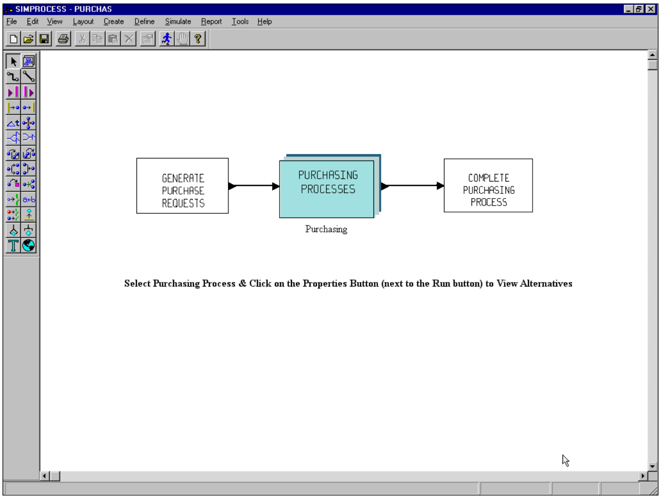
The high degree of change in the business environment has created a new challenge for industrial and service enterprises. That challenge is to determine an organizational structure that minimizes administrative costs while maximizing service to its customers.

Traditionally, managers have used organization charts to describe hierarchical structures and evaluate business decisions regarding changes to the organization. Unfortunately, these tools are no longer adequate because they do not take into account the process view and dynamics associated with administrative processes. Documenting the processes, understanding the dynamics of the business processes and activity costs in a changing administrative process can only be achieved with a tool like SIMPROCESS.

This hierarchical model of a purchasing process consists of five major processes. They are:

- Select Supplier
- Negotiate Terms and Pricing
- Prepare Purchase Order
- Place Purchase Order
- Audit Invoice

The demonstration model highlights one of the unique features of SIMPROCESS — the ability to create alternative representations of a hierarchical business process. In this model, the purchasing process object consists of three alternative organizational representations.



Alternative 1 — Functional, Centralized Purchasing:

The purchasing process is performed by a centralized, functional organization where the five functions are performed by staff dedicated to each function.

Alternative 2 — Product based, Decentralized Purchasing:

The purchasing process is performed by three decentralized, product organizations where the each product organization performs all five functions for its product line.

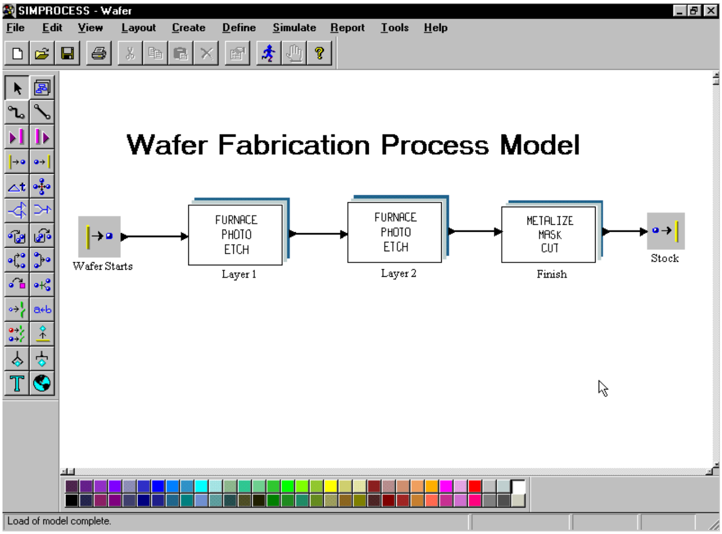
Alternative 3 — Hybrid Purchasing:

The purchasing process is performed by a hybrid organization where the supplier selection and terms and pricing functions are performed by a centralized organization; and the other three functions are performed by decentralized, product organizations.

Wafer Fabrication Process Model

(model name: Wafer.spm)

This demonstration model shows a wafer fabrication process. The highest level of the model shows batches of raw wafer entering the system, moving through three high level processes, and leaving the system as stock.



The first two processes represent photo etching processes. Both processes add a layer to each wafer that passes through them. Descending into either process, you will find another layer of three processes, with a re-work loop. The decision logic for the re-work loop is based on probability. A percentage of the wafers that traverse the three processes will be sent back to the start of this process.

The Photo, Furnace and Etch processes all contain a series of Delay activities representing the steps of each process. The final activity of each process is an inspection step represented by a Branch activity. Some percentage of the wafers that pass through the inspection step will be discarded as scrap.

The final high level process, Metalize Mask Cut, contains a series of steps with two inspection stations.

This model can be used to predict the cycle time to produce wafers and the utilization of the resources used in the process.

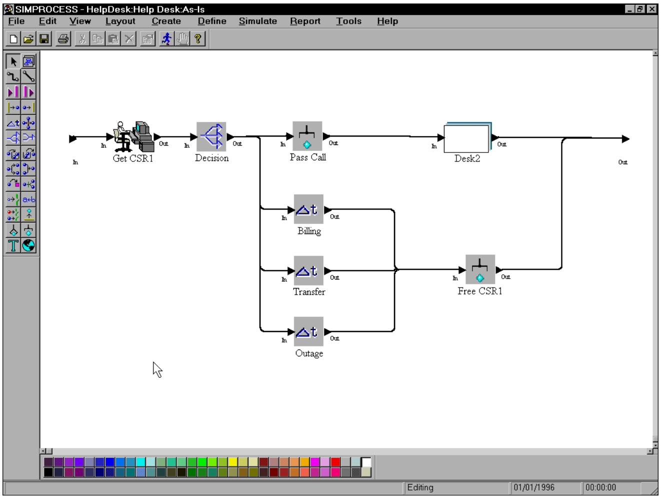
Help Desk Model

(model name: HelpDesk.spm)

Today, customers are much more demanding and cost-conscious than they were 5 or 10 years ago. Increasing competitive pressures make it a tough challenge for service enterprises to maximize service quality while minimizing costs. Such performance metrics as waiting time and activity costs are critical to providing quality service and strategically pricing services.

Typically, staffing and communication technology decisions for a customer service process have been made by analytical tools which fail to take into account the randomness and system dynamics that result in queuing. SIMPROCESS provides a complete set of statistical tools such as probability distributions, Data Analysis, and Design of Experiments; and advanced modeling features such as cyclical generation of entities, and resource downtimes.

This demonstration model shows how SIMPROCESS can be used for modeling the random nature of a Help Desk. The Help Desk utilizes three types of Customer Service Representatives (CSRs) to handle incoming customer calls. These CSRs are modeled as resources. The three types of CSRs are:



CSRhelp

Customer Service Representative trained to handle calls regarding transfer of ownership, power outage and billing inquiries.

CSRpage

Customer Service Representative trained to handle calls regarding paging inquiries.

CSR

Customer Service Representative *cross-trained* to handle calls regarding transfer of ownership, power outage, billing *and* paging inquiries.

The hierarchical business process "Help Desk" contains two alternative ways of utilizing the same total number of resources. The business objective of this exercise is to best utilize the CSRs to minimize the time customers spend on hold waiting for an available Representative.

Alternative 1:

This is the “As-Is” process. When a call arrives, it is answered by the first available CSRhelp. The Representative determines what the inquiry is regarding. The CSRhelp then either passes the call to “Desk 2” if it is a paging inquiry, or else handles the call. If the call is passed to Desk 2, the customer is put on hold until a CSRpage is available.

Alternative 2:

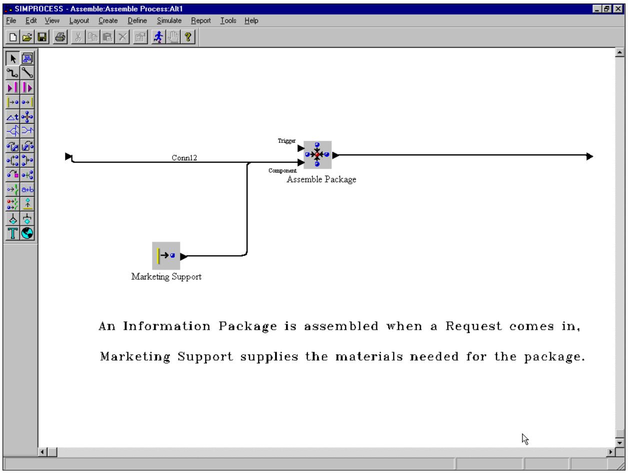
This is the “To Be” version of the process. When a call arrives, it is answered by the first available CSR. The Representative determines what the inquiry is regarding and services the customer regardless of the category.

Assemble Reference Model

(model name: Assemble.spm)

This model is a simple example of how the Assemble activity is used. A list of component entities and their quantities is specified on the Assemble Activity. When all of the required component entities are present at the activity, a new entity is created. The component entities are either deleted when the new entity is created, or they are batched and carried with the new component. This is controlled by a check box on the Assemble Activity Properties dialog.

The Generate and Dispose activities are placed at the highest level of the model, with the Assemble Process. Double-click on the icon representing the Assemble Process to descend one level. Here you will see two activities, another Generate activity and an Assemble activity. Request Info Pack is the original entity in this model, and is created using a periodic schedule at the Request Info Package activity. The Requests follow the connector to the Assemble process. At the Assemble activity, the Requests will be combined with a Folder, Brochure and a Demo Diskette. The Folder, Brochure and Demo Diskette are re-supplied weekly or monthly based on calendar type schedules for each entity type. Once all four of the required entities are at the activity, a new entity is created, an Information Package. The component entities are now deleted. All of the statistics gathered on them are complete. The Information Package follows the connector out of the Assemble Process to Mail.



Run the model to gather the statistics and display the reports. Typically, the statistic of most interest when using the Assemble activity, is the "Hold for Condition" time of the entities. This will record the amount of time the component entities are held at the Assemble activity until the specified component entities have arrived. In this example, a Request Info Pack, Folder, Brochure and a Demo Diskette, are needed to build an Information Package. The Hold for Condition statistic will show you the average or peak amount of time each component was held at the Assemble activity until all required component entities are available. For this example, we are most interested in how long the Requests for Information Packages had to wait before the pieces of the Information Package were all available. Essentially, we are seeing if our re-order strategies for the pieces of the Information Package is causing too long of a turn-around time for getting Information Packages out to prospective customers. The average Hold for Condition time for the Request Info Pack is .1918 hours and the peak Hold for Condition time is 23 hours. This shows, that with this re-order strategy, Requests for Information Packages wait on average 11 and a half minutes for all of the components for the Information package to be available. We also see that the longest wait is just under one day. This is probably acceptable. In this simple example, no resources are required for any steps in the model, so the "Wait for

Resource” time is zero. The “In Process Time” refers to the time the entities spent in a Delay activity, or at the duration specified on any other type of activity.

Batch/Unbatch Reference Model

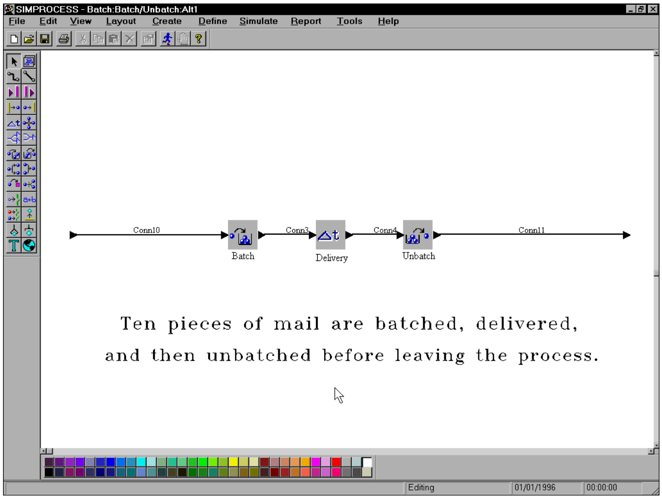
(model name: Batch.spm)

This model is a simple example of how the Batch and Unbatch activities are used. The Batch activity will hold entities until the specified quantity of entities has accumulated, then a batch of those entities is formed. The Unbatch activity breaks the batch back down to its component entities.

The Generate and Dispose activities are placed at the highest level of the model, with the Batch/Unbatch process. Double-click on the icon representing this process to descend one level. Here you will see three activities, a batch activity, delay activity and an unbatch activity. Mail is the entity in this model, and is created using a periodic schedule at the generate activity. The pieces of Mail follow the connector to the Batch/Unbatch process. The first step in the process, the Batch activity, holds the Mail until ten pieces have accumulated. The “batch” of ten pieces of Mail moves to Delivery where it takes one hour to move the batch from the district office to a local office. Once the batch of Mail arrives at the local office, the Mail is unbatched. The ten component pieces of Mail are released and follow the connector out of the Batch/Unbatch process.

Run the model to gather the statistics and display the reports. Typically, the statistic of most interest when using the batch activity, is the “Hold for Condition” time. This will record the amount of time the entities are held at the batch activity until the number of entities specified have arrived. In this example, ten pieces of Mail are needed for a batch. The Hold for Condition statistic will show you the average or peak amount of time a piece of Mail was held at the batch activity until the specified number of pieces of Mail reached the activity and a batch was formed. In this example, the average Hold for Condition time is 2.045455 hours and the peak Hold for Condition time is 4.55 hours. In this simple example, no resources are required for any steps in the model, so the “Wait for Resource” time is zero. The “In Process Time” refers to the time the entities spent in a Delay activity, or at the duration specified on any other type of activity. In this model, In Process Time measures the amount of time spent in the Delivery, which is one hour.

One important last note, when the entities are unbatched, they regain the individual identity they had before being batched. For example, if you had attached a unique attribute to each of your entities before they were batched, when they are unbatched, the individual entities will still contain their own unique value of that attribute.

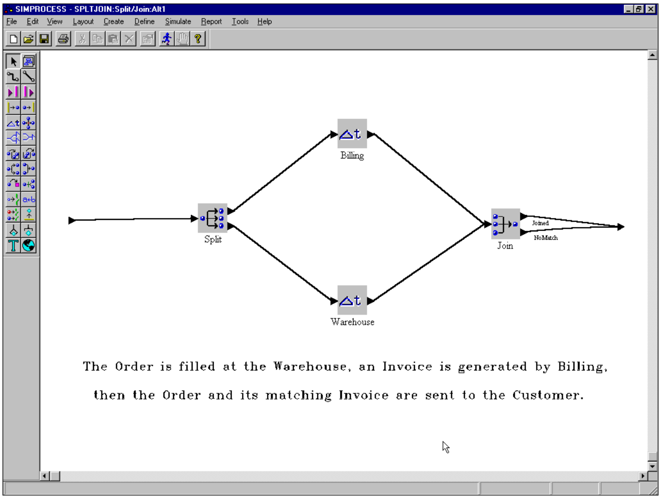


Split/Join Reference Model

(model name: SplitJoin.spm)

This model is a simple example of how the Split and Join activities are used. When an entity reaches the Split activity, a clone or clones of the entity is created. The original entity will exit the Split activity from the pad labeled “original”. The clone entities will exit the Split activity from the pad labeled clones. The number of clones made corresponds to the number of connectors you have from the clones pad. The original entity and its clone(s) are referred to as a “family”. The Join activity will hold the original entity and its clone entities until the entire family has reached that activity. The original entity will then continue through the model. The clone entities are deleted by default, or can be batched with the original entity.

The Generate and Dispose activities are placed at the highest level of the model, with the Split/Join process. Double-click on the icon representing this process to descend one level. Here you will see four activities, a Split activity, two Delay activities, and a Join activity. Orders are the original entity in this model, and are created using a periodic agenda at the Incoming Orders activity. The Orders follow the connector to the Split/Join process. The first step in the process, the Split activity, creates a clone of the Order, called “Invoice”. The Order then moves to Shipping where the Order is filled from stock on hand, when the Order moves to the Join activity. The Invoice moves to billing, when work is completed there, it moves to the Join activity. When both the Order and its matching Invoice arrive at the Join activity, they are batched and follow the connector out of the Split/Join process.



Run the model to gather the statistics and display the reports. Typically, the statistic of most interest when using the Join activity, is the "Hold for Condition" time. This will record the amount of time the entities are held at the Join activity until the original entity and all of its clones have arrived. In this example, an Order and its Invoice are needed. The Hold for Condition statistic will show you the average or peak amount of time an Order or Invoice was held at the Join activity until the rest of its family reached the activity. In this example, the average Hold for Condition time for the Invoices is .925219 hours and the peak Hold for Condition time is 3.526171 hours. The average Hold for Condition time for the Orders is .686906 hours and the peak Hold for Condition time is 10.205694 hours. In this example, no resources are required for any steps in the model, so the "Wait for Resource" time is zero. The "In Process Time" refers the time the entities spent in a Delay activity, or at the duration specified on any other type of activity. In this model, In Process Time measures the amount of time spent in the Shipping and Billing activities as they are the only Delays or durations in this model.