

TIBCO Business Studio™

Simulation User's Guide

Software Release 3.6.0
September 2013

Two-Second Advantage®



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Preface

The simulation features of TIBCO Business Studio allow you to simulate a Process that has been developed in TIBCO Business Studio to identify areas of the Process that can be improved such as bottlenecks and areas of high cost or reduced service levels.

Topics

- [Typographical Conventions, page vi](#)
- [Connecting with TIBCO Resources, page ix](#)

Typographical Conventions

The following typographical conventions are used in this manual.

Table 1 General Typographical Conventions

Convention	Use
<i>TIBCO_HOME</i> <i>STUDIO_HOME</i>	<p>Many TIBCO products must be installed within the same home directory. This directory is referenced in documentation as <i>TIBCO_HOME</i>. The default value of <i>TIBCO_HOME</i> depends on the operating system. For example, on Windows 7 systems, the default value is C:\Program Files (x86)\tibco</p> <p>TIBCO Business Studio installs into a directory within <i><TIBCO_HOME></i>. This directory is referenced in documentation as <i>STUDIO_HOME</i>. The default value of <i>STUDIO_HOME</i> depends on the operating system. For example on Windows 7 systems, the default value is C:\Program Files (x86)\TIBCO\studio-bpm-35.</p>
code font	<p>Code font identifies commands, code examples, filenames, pathnames, and output displayed in a command window. For example:</p> <p>Use MyCommand to start the foo process.</p>
bold code font	<p>Bold code font is used in the following ways:</p> <ul style="list-style-type: none"> • In procedures, to indicate what a user types. For example: Type admin. • In large code samples, to indicate the parts of the sample that are of particular interest. • In command syntax, to indicate the default parameter for a command. For example, if no parameter is specified, MyCommand is enabled: MyCommand [enable disable]
<i>italic font</i>	<p>Italic font is used in the following ways:</p> <ul style="list-style-type: none"> • To indicate a document title. For example: See <i>TIBCO ActiveMatrix BusinessWorks Concepts</i>. • To introduce new terms For example: A portal page may contain several portlets. <i>Portlets</i> are mini-applications that run in a portal. • To indicate a variable in a command or code syntax that you must replace. For example: MyCommand <i>PathName</i>

Table 1 General Typographical Conventions (Cont'd)

Convention	Use
Key combinations	Key name separated by a plus sign indicate keys pressed simultaneously. For example: Ctrl+C. Key names separated by a comma and space indicate keys pressed one after the other. For example: Esc, Ctrl+Q.
	The note icon indicates information that is of special interest or importance, for example, an additional action required only in certain circumstances.
	The tip icon indicates an idea that could be useful, for example, a way to apply the information provided in the current section to achieve a specific result.
	The warning icon indicates the potential for a damaging situation, for example, data loss or corruption if certain steps are taken or not taken.

Table 2 Syntax Typographical Conventions

Convention	Use
[]	An optional item in a command or code syntax. For example: MyCommand [optional_parameter] required_parameter
	A logical OR that separates multiple items of which only one may be chosen. For example, you can select only one of the following parameters: MyCommand para1 param2 param3

Table 2 *Syntax Typographical Conventions*

Convention	Use
{ }	<p>A logical group of items in a command. Other syntax notations may appear within each logical group.</p> <p>For example, the following command requires two parameters, which can be either the pair <code>param1</code> and <code>param2</code>, or the pair <code>param3</code> and <code>param4</code>.</p> <pre>MyCommand {param1 param2} {param3 param4}</pre> <p>In the next example, the command requires two parameters. The first parameter can be either <code>param1</code> or <code>param2</code> and the second can be either <code>param3</code> or <code>param4</code>:</p> <pre>MyCommand {param1 param2} {param3 param4}</pre> <p>In the next example, the command can accept either two or three parameters. The first parameter must be <code>param1</code>. You can optionally include <code>param2</code> as the second parameter. And the last parameter is either <code>param3</code> or <code>param4</code>.</p> <pre>MyCommand param1 [param2] {param3 param4}</pre>

Connecting with TIBCO Resources

How to Join TIBCOmmunity

TIBCOmmunity is an online destination for TIBCO customers, partners, and resident experts. It is a place to share and access the collective experience of the TIBCO community. TIBCOmmunity offers forums, blogs, and access to a variety of resources. To register, go to <http://www.tibcommunity.com>.

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You can access TIBCO documentation here:

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- For an overview of TIBCO Support, and information about getting started with TIBCO Support, visit this site:

<http://www.tibco.com/services/support>

- If you already have a valid maintenance or support contract, visit this site:

<https://support.tibco.com>

Entry to this site requires a user name and password. If you do not have a user name, you can request one.

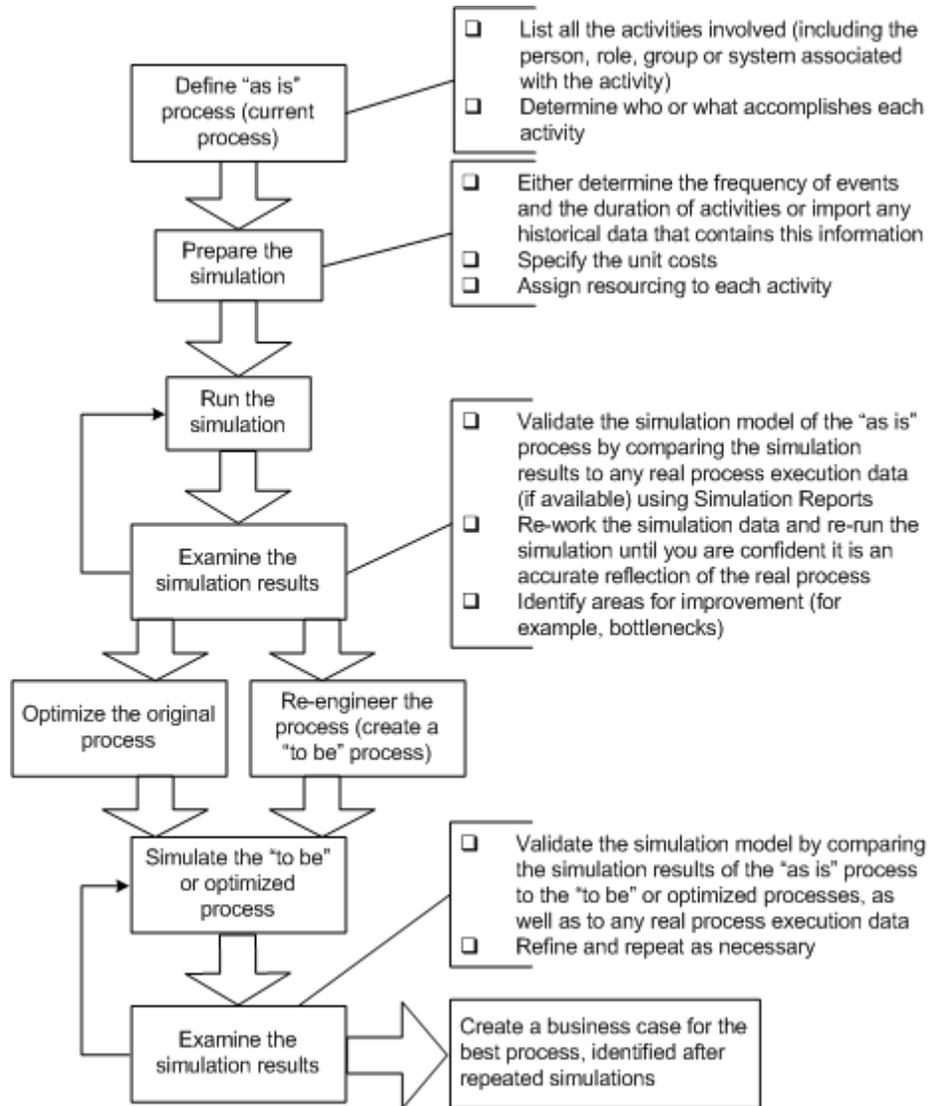
The TIBCO Business Studio™ simulation features allow you to simulate a Process that has been developed in TIBCO Business Studio to identify areas of the Process that can be improved such as bottlenecks and areas of high cost or reduced service levels. For example, if Service Level Agreements (SLAs) are not being consistently met, you can re-engineer your processes to correct this, thus improving customer satisfaction and increasing customer retention. Simulation can also perform a vital role in implementing the Six Sigma methodology for continuous improvement of processes.

Topics

- [Overview, page 2](#)
- [Tutorial 1: Setting Up a Simple Simulation, page 3](#)
- [Tutorial 2 - Running a Simulation, page 7](#)
- [Tutorial 3 - Interpreting the Results of Simulation, page 9](#)
- [Tutorial 4 - Changing Simulation Properties, page 10](#)
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- [Tutorial 8 - Using Historical Data for Activity Duration, page 19](#)
- [Tutorial 9 - Monitoring SLAs, page 24](#)

Overview

The following diagram summarizes the TIBCO Business Studio approach to simulation. All of these topics are discussed in detail in [Simulating Business Processes](#), page 36.



Tutorial 1: Setting Up a Simple Simulation

In this tutorial we will prepare a Process for [Simulation](#) by completing the following steps:

- [Create the Claims Management Process](#)
- [Add the Participants](#)
- [Specify the Unit Cost of the Participants](#)
- [Specify the Duration of the Activities](#)
- [Associate the Participants with the Activities](#)
- [Add the Data Fields](#)

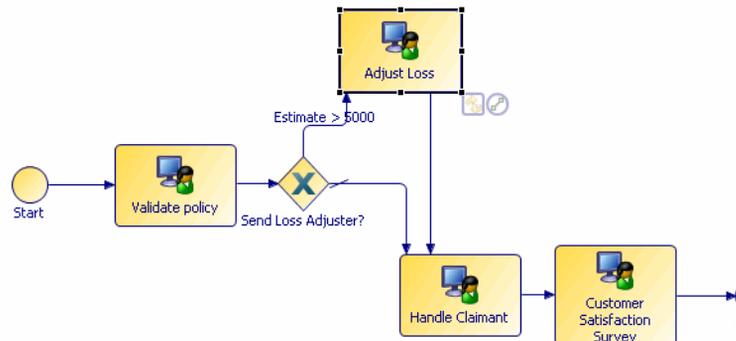


This tutorial assumes that you are familiar with the modeling features of TIBCO Business Studio (for more information, see the TIBCO Business Studio modeling documentation).

Task A Create the Claims Management Process

Create an Analyst Project with the Simulation destination environment checked on the project level.

Create a new Package for the Process you are about to create and call it Claims Management. Create a Process called Claims Management that looks like this:



Note that the data flow between **Send Loss Adjuster?** and **Adjust Loss** must be a conditional flow, and the flow to the **Handle Claimant** Activity must be a default flow.

Ensure that the Destination Environment is set to Simulation as follows:

1. Select the Claims Management Process in the Project Explorer.
2. Click the **Destinations** tab and select **Simulation** as the Destination Environment.

Task B Add the Participants

1. In the Project Explorer, expand the tree down to the **Claims Management** Process Package.
2. Right-click **Participants** and select **New Participant**. The **New Participant** wizard is displayed.
3. The **Participant Details** dialog is displayed first. Enter Call Center Operator for the **Name**, and select **Role** as the **Type**. You can optionally press **Next** to enter a **Description** of the role.
4. Click **Back** from **Participant Details** if you want to change the default values for **Project**, **Package** or **Process**.
5. Click **Finish** and note that Call Center Operator is added to **Participants** in the Project Explorer under the **Claims Management** Process Package.
6. Repeat these steps to add **Loss Adjuster** and **Claims Handler** as an additional Role Participants.
7. Simulation data is not added automatically. Go to Simulation tab for the Participant to add simulation data.

Task C Specify the Unit Cost of the Participants

1. Select the **Call Center Operator** Participant and go to the Properties view.
2. Click the **Simulation** tab, and edit the Simulation Data as follows:
 - **Number Of People/Machines** - How many of this resource are required. Enter **3**.
 - **Cost Per Unit** - Cost per Unit (for example cost per hour). Enter **7.5**.
 - **Unit** - Specifies the time period against which the Cost is measured. Select **HOUR**.
3. Do the same for the **Loss Adjuster** Participant, but specify the following:
 - **Number Of People/Machines** - How many of this resource are required. Enter **2**.
 - **Cost Per Unit** - Cost per Unit (for example cost per hour). Enter **30**.
 - **Unit** - Specifies the time period against which the Cost is measured. Select **HOUR**.
4. In the same way, modify the Simulation Data for the **Claims Handler**:
 - **Number Of People/Machines** - How many of this resource are required. Enter **10**.
 - **Cost Per Unit** - Cost per Unit (for example cost per hour). Enter **15**.
 - **Unit** - Specifies the time period against which the Cost is measured. Select **HOUR**.

Task D Specify the Duration of the Activities

1. Select the **Validate Policy** Activity.
2. Go to the Properties view and edit the Simulation Data as follows:
 - Select NORMAL as the **Duration Distribution**.
 - Select MINUTE for the **Time Unit** with a Mean value of 5 and a Standard Deviation of 2.
3. Do the same for the **Adjust Loss** Activity, but select NORMAL distribution, HOUR, with a mean of 2 and standard deviation of 0.25.
4. For the **Handle Claimant** Activity, specify NORMAL distribution, DAY, with a mean of 2 and standard deviation of 0.25.
5. For the **Complete Customer Survey** Activity, specify a CONSTANT distribution of 5 minutes.
6. Click the **Start** Event and specify a EXPONENTIAL distribution with a mean of 60 minutes and accept the default number of cases which is 100.

Task E Associate the Participants with the Activities

1. Highlight the **Validate Policy** Activity.
2. Go to the Properties view and click the **General** tab.
3. Browse to select the **Call Center Operator** as the **Participant**.



You can also associate a Participant with an Activity by right-clicking the Activity and selecting **Participant**, or using drag and drop to drag a Participant over an Activity and make the association.

4. Do the same for the **Adjust Loss** Activity, but select the **Loss Adjuster** Participant.
5. Assign the **Claims Handler** Participant to the **Handle Claimant** Activity.
6. Assign the **Call Center Operator** Participant to the **Complete Customer Survey** Activity.

Task F Add the Data Fields

1. In the Project Explorer, under the **Claims Management** Process, right-click **Data Fields** and select **New Data Field**.
2. The **Data Field Details** dialog is displayed. Enter **Policy** as the **Name** of the Data Field and select **String** as the **Type**.
3. You can optionally click **Next** to enter a description.

4. You can optionally click **Back** from the **DataField Details** dialog if you want to check the displayed Project and Package. For this tutorial, you can accept the defaults.
5. Click **Finish**.
6. Repeat these steps to create a Customer string Data Field.
7. In the Process Editor, highlight the **Validate Policy** Activity.
8. In the Properties view, click the **Parameters** tab.
9. Click the **Add** button next to the **In-bound Parameters** field to browse for the **Policy** and **Customer** Data Fields. Holding down the **Ctrl** key, select both and click **OK**.
10. The Data Fields you selected are displayed in the Properties view.
11. Associate the **Policy** and **Customer** Data Fields with each of the remaining Activities in the Process.

Compare the Process you have created with the one in the samples workspace (**Simulation Tutorial Solutions** Project) and continue with the next tutorial to run the simulation.

Tutorial 2 - Running a Simulation

The simulation is now ready to run.

1. Save the Package that contains the **Claims Management** Process.
2. Check the Problems view for any errors in the Process. If any exist, right-click them and select **Quick Fix** to correct them (if no Quick Fix is available, open the Process to correct the problem).
3. In the Project Explorer, select the **Claims Management** Process, right-click, and select **Prepare Simulation**.



When you select **Prepare Simulation**, TIBCO Business Studio sets up parameters necessary for the simulation to run, in this case defining how data flows through the **Send Loss Adjuster?** gateway. Selecting **Prepare Simulation** can also fix some problems that do not have Quick Fixes available.

4. Select **Simulation** perspective in the upper right of your workspace. This adds the Simulation Control and Simulation Results views to your workspace.



Alternatively, you can run the simulation as described in the next step and TIBCO Business Studio changes the perspective automatically.

5. In the Project Explorer, select the **Claims Management** Process, right-click, and select **Run As > Run Simulation**. If prompted, click **Yes** to save any unsaved changes.



By default a simulation runs with a Simulation Start Date/Time that is the current system date/time, but you can set the desired Simulation Start Date/Time using the drop-down calendar and by entering a time value. For more information, see [Simulation Time on page 33](#).

6. The simulation runs:
 - The [Simulation Control View, page 68](#) shows simulation time and the progress of simulation.
 - The [Simulation Results View, page 69](#) displays the number of cases and updated simulation data about the Activities and Participants such as the Cost.
 - The number of queued and processed cases is indicated on the Process (see [View the Simulation Progress on page 41](#)).

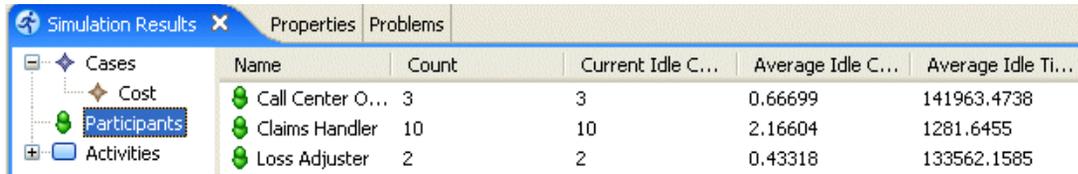
In our example, we simulated 100 cases (the default number of cases for simulation is 100, however this can be configured).

After the 100 cases of the simulation complete, continue with the next tutorial to interpret the simulation results.

Tutorial 3 - Interpreting the Results of Simulation

After running a simulation, the Simulation Results view shows information about the following:

- **Cases** - a summary of the simulation, including the number of cases started and finished as well as cost and case times (average, minimum and maximum).
- **Participants** - information about Participants. For example:



The screenshot shows the 'Simulation Results' window with the 'Participants' tab selected. The table displays the following data:

Name	Count	Current Idle C...	Average Idle C...	Average Idle Ti...
Call Center O...	3	3	0.66699	141963.4738
Claims Handler	10	10	2.16604	1281.6455
Loss Adjuster	2	2	0.43318	133562.1585

- **Activities** - information about the cost of Activities, distribution into queues, wait times, and so on.

For more information, see [Simulation Results View on page 69](#).

By changing properties in the Process such as the number of Participants or by changing the Process itself, you can re-run the simulation and see the effect of your changes.

For example, if initially there is only one Participant for each Activity, you could run a simulation to see the maximum number of items in a queue and the wait times. If these numbers are higher than you would like, one solution is to increase the number of Participants. For example, in the previous insurance example, five Call Center Operators, three Loss Adjusters and 12 Claims Handlers should result in reduced wait times with fewer items in queues.

You can also export the simulation data to an HTML report. See [Creating and Viewing a Simulation Report on page 53](#).

Continue with the next tutorial to see how to change simulation properties.

Tutorial 4 - Changing Simulation Properties

To simplify the simulation of Processes, TIBCO Business Studio provides default values for significant simulation parameters. These along with simulation parameters that you specify make up the Scenario that is used for simulation (see [Scenario on page 30](#)).

This tutorial shows how to modify the simulation properties of a Process. To do this, perform the following steps:

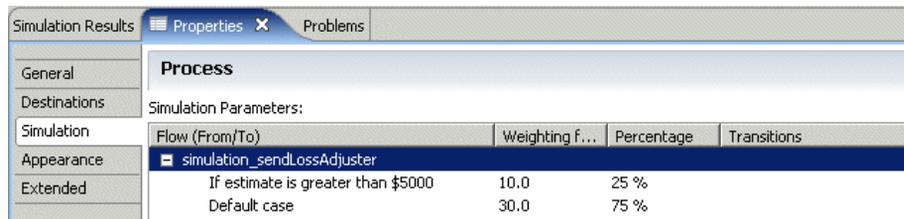
1. Open the **Claims Management** Process that you created in the previous tutorial.
2. Click on the white area of the Lane where the Process is displayed.
3. Go to the Properties view and click the **Simulation** tab.
4. The simulation properties of the process are displayed. For example:

Simulation Parameters:

Flow (From/To)	Weighting f...	Percentage	Transitions
simulation_sendLossAdjuster7			
0 : (transitionId=3)	10.0	50 %	Send Loss Adjuster? to Adjust Loss
1 : (transitionId=7)	10.0	50 %	Send Loss Adjuster? to Handle Claimant

This shows that from the **Validate Policy** Activity, the cases are distributed 50:50 to the **Adjust Loss** and **Process Claimant** Activities.

5. You can change this distribution of cases by changing the weighting. Click in the **Weighting factors** column and change the weighting to 30:10, which changes the **Percentage** to 75:25. In the following example, the Sequence Flows have been renamed as well:



Simulation Results Properties Problems

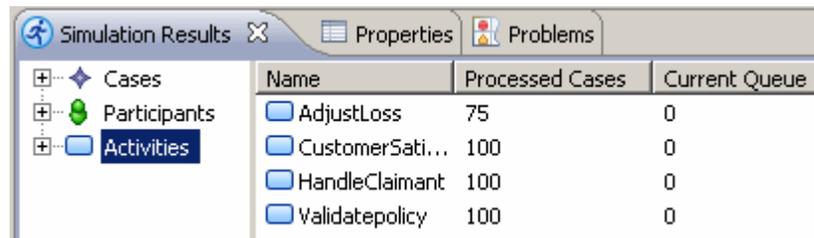
General Process

Destinations Simulation Parameters:

Flow (From/To)	Weighting f...	Percentage	Transitions
simulation_sendLossAdjuster			
If estimate is greater than \$5000	10.0	25 %	
Default case	30.0	75 %	

Simulation Appearance Extended

6. Re-run the simulation and note in the Simulation Results view that the cases are now distributed according to the weighting that you entered:



Simulation Results Properties Problems

Name	Processed Cases	Current Queue
AdjustLoss	75	0
CustomerSati...	100	0
HandleClaimant	100	0
Validatepolicy	100	0

Now 75 cases are distributed to the Adjust Loss Activity versus 50 in the previous simulation run.

For more information about the simulation properties, see [Simulation Properties View on page 73](#).

Tutorial 5 - Viewing and Comparing the Results of Simulation

In the previous tutorial, we changed the case distribution to the **Adjust Loss** and **Process Claimant** Activities from 50:50 to 25:75. This affects the utilization of the Participants involved. TIBCO Business Studio provides a Simulation Report view that will illustrate the effect of this change.



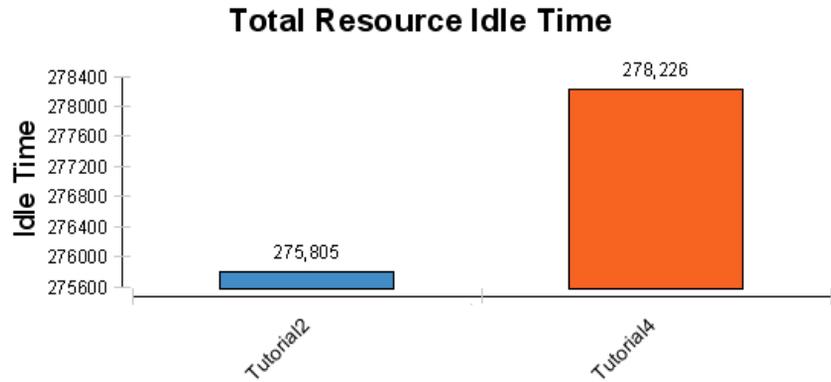
This tutorial assumes that you have completed the previous tutorials and have two sets of simulation results (those from the original Process and the results obtained after changing the simulation properties). The results are also available in the Simulation Tutorial Solutions project under the **Simulation** folder.

1. In the Project Explorer, expand the **Simulation** folder and its sub-folders and select the relevant **.sim** files that were created when you simulated the process (for example, 2006-03-11_15-56-38.sim). Highlight the **.sim** files that you want to compare, right-click and select **Compare Simulation Results**.

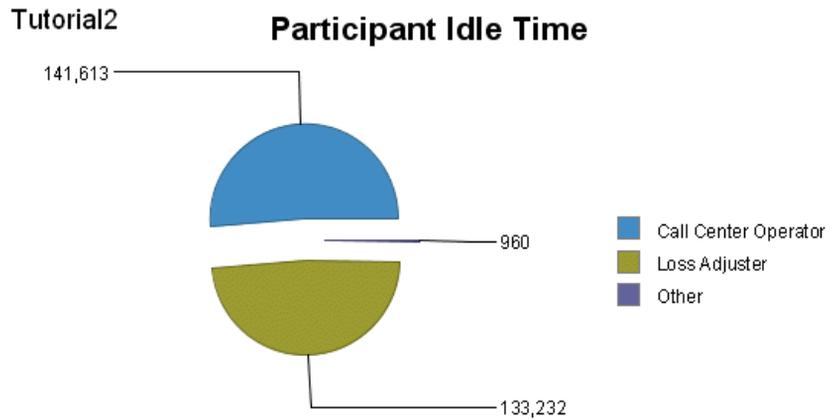
This opens the **Compare Simulation Results** view.

2. Select the check boxes for the two (or more) sets of results that you want to compare.
3. There are two pre-defined comparison tools that you can use:
 - **Case Cost-Time Analysis** - shows charts and tables that display such information as the minimum, average and maximum case times for each experiment.
 - **Participant Utilization** - shows charts that display idle time and costs for the Participants in the process.
4. Select **Participant Utilization** and click **Display Report**.
5. The comparison report is generated and displayed (you can also save the **Case Cost-Time Analysis** and **Participant Utilization** reports to HTML and PDF formats). Remember that the difference between the two simulations was the distribution of cases to the **Claims Handler** and **Loss Adjuster** participants. The first

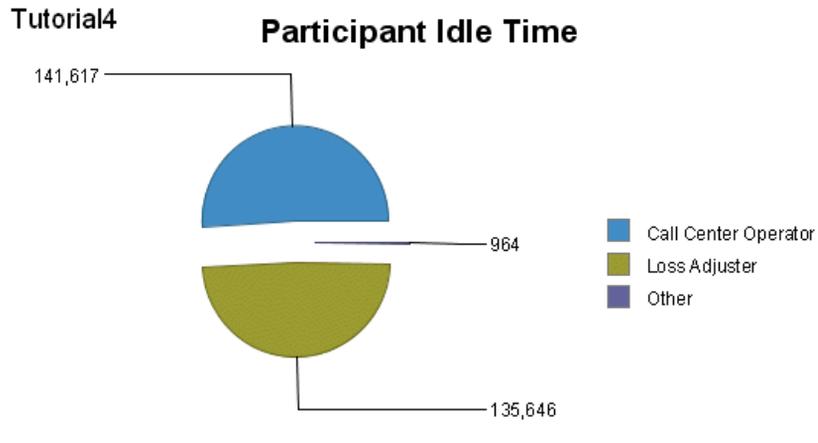
chart shows that the overall Participant idle time (expressed in total minutes) has increased:



To see why this is so, look at the next two charts, which show Participant Idle time. This is the chart with a 50:50 distribution:



The second chart shows the 75:25 distribution:



Because fewer cases are sent to the Loss Adjuster, this Participant's idle time has increased. This is also reflected in lower utilization in the Tutorial 4 results.



There are several aspects of simulation to note when comparing simulations:

- When comparing pie charts such as the previous two, note that the total idle time for each is different, so a similarly-sized segments do not represent the same value.
- A Participant's utilization drops if they have finished their work but the simulation is still running. For this reason it is best to view the running simulation to get a true picture of a Participant's utilization while work is being done.

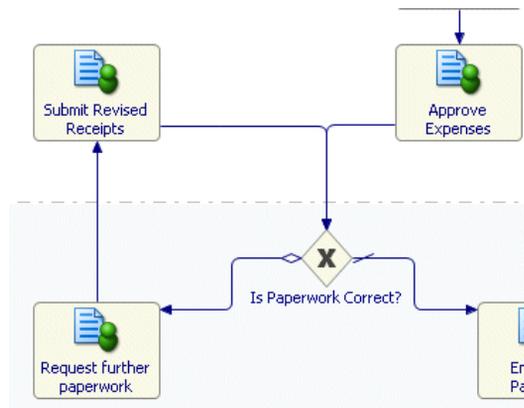
You can save Portable Document Format (PDF) and HTML versions of the comparison report by clicking the appropriate button.

Continue with the next tutorial to see how to use looping with your simulation.

Tutorial 6 - Using Loops in Simulation

When simulating a Process you should avoid infinite loops by providing a Simulation Control strategy. If you create a loop without a Simulation Control, TIBCO Business Studio reports this as an error in the Problems view. This tutorial shows how to use a loop in Process simulation.

1. Open the **Submit Expenses** Process from the **Basic Samples** Project. Look at the following portion of the Process:

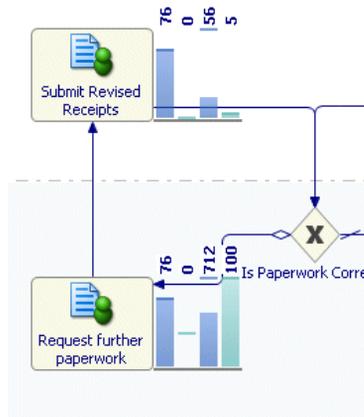


Simulating this Process would create an infinite loop because there is nothing to notify TIBCO Business Studio to end the loop. Subsequent steps show how to specify a way to break out of the loop for simulation purposes.

2. Click the **Submit Revised Receipts** Activity. In the **Properties** view, click the **Simulation Control** tab.
3. Click the **Simulation control** link to add a simulation control strategy.
4. There are three strategies from which you can select to break out of the loop:
 - **Max Loop Count** - after the specified number of times through it.
 - **Max Elapse Time** - after the specified amount of simulation time has elapsed.
 - **Normal Distribution** - based on a normal distribution of times through the loop.

In this example, select **Normal Distribution** with a mean of 2 and standard deviation of 0.5.
5. For **Decision Activity** select **Is Paperwork Correct?**. This informs TIBCO Business Studio which Activity will be used to decide whether to end the loop.
6. For **To Activity**, select **Enqueue Payment**. This informs TIBCO Business Studio which Activity to proceed with once the loop is finished.

7. Save the Package containing the Process.
8. Highlight the Process, right-click and select **Run As > Run Simulation**.
9. For 100 cases, the finished simulation for the Activities in the loop should look like this:

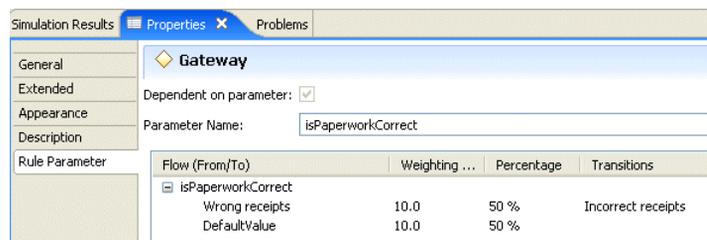


100 cases reach the **Is Paperwork Correct?** Gateway. Because the weighting of the Gateway is 50:50, 50 cases proceed to the Enqueue Payment Activity. The remaining 50 cases are travel through the two Activities in the loop again resulting in 76 cases passing through this Activity.

Tutorial 7 - Controlling Flow From a Gateway

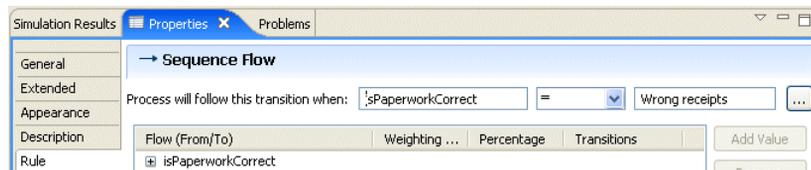
You can control flow from a Gateway by specifying a Parameter to be used as in a Rule. On a conditional Sequence Flow exiting the Gateway, you can specify that the Sequence Flow is followed only when values for that Parameter match the expression specified in the Rule.

1. Open the **Submit Expenses** Process from the previous tutorial. Click the **Is Paperwork Correct?** Gateway.
2. Click the **Rule Parameter** tab. This shows the Parameter and values that will be evaluated to determine the output flow from this Gateway. The Parameter in this case is **isPaperworkCorrect**.



In this case, there are two values for the Parameter, **Wrong receipts** and **Correct receipts**.

3. To see how these values control the flow from the Gateway, highlight the conditional Sequence Flow that comes from the Gateway and in the Properties view, click the **Simulation** tab.



This shows that this Sequence Flow is only traversed when the **isPaperworkCorrect** Parameter has the value **Wrong receipts**. Any cases with other values for this Parameter will follow the default Sequence Flow.

4. To test how the Gateway controls the flow, you can adjust the Weighting as described in [Tutorial 4 - Changing Simulation Properties on page 10](#). For example, if 90% of those submitting expenses get the paperwork right the first time, you could adjust the weighting accordingly and run the simulation. This would show far fewer cases going through the **Wrong receipts** path.

You can also use the **Rule Parameter** with imported data as described in the next tutorial.

Tutorial 8 - Using Historical Data for Activity Duration

As part of setting up a Process for simulation, you specify the duration of the Activities in the Process using a mathematical distribution (for example, Normal distribution). Alternatively, TIBCO Business Studio allows you to import any real historical data that you have about activity duration. This tutorial describes how to do this using a sample Process and data. The sample Process is one that represents the renewal process for insurance policies.

Task A Review the Import File

Open the **renewal.xls** spreadsheet located in the samples directory where you installed TIBCO Business Studio and take a minute to look at it. The first row of cells corresponds to the parameter names:

- **Case Number** - a unique number to identify the case. This will be ignored when we import the data into TIBCO Business Studio.
- **Activity Name** - the Activity being performed. Note the Activity Names do not have to match exactly the names of the Activities in the Process; the Import wizard allows you to map Activities between the spreadsheet and the Process.
- **Duration** - the amount of time it takes to perform the Activity. The time unit is specified in the Import wizard.
- **Existing Customer?** - this Parameter affects how long it takes to get the customer details.
- **Number of Drivers** - the number of drivers to be insured.

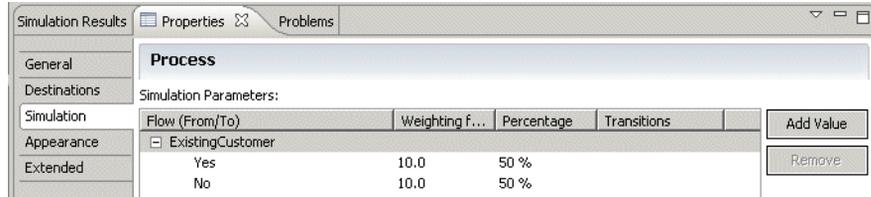
Each column under the first row represents the parameter values that will be imported.

Task B Create the Parameter

In this example, the data on whether a customer is new or existing will affect the duration of the Take Customer Details Activity. For this reason, we need to create a Parameter to represent whether a customer is new or existing.

1. In the Project Explorer under the Process, right-click **Parameters** and select **New Parameter**.
2. Click **Next** to accept the displayed Project, Package and Process.
3. Enter **ExistingCustomer** as the **Name**, select **String** for the **Type** and click **Finish**.
4. In the Project Explorer, select the Process and go to the Simulation tab on the Properties view. This shows the Parameter that you created (ExistingCustomer).

- Click **Add Value**. This adds a value called New Value. Double-click the value and rename it to Yes. Repeat this to create a No value. The result should look like this:



Task C Import the Data

To import the spreadsheet containing your historical data, do the following:

- Right-click the **Renewal Process** and select **Import**.
- Select **Historical Case Data (Activity Duration)**.
- The names of the Project, Package and Process are displayed. Click **Next**.
- Either click **Browse** or **Browse Workspace** to locate the **renewal.xls** file and click **Next**.
- The **Select Parameters** dialog is displayed. This allows you to specify which columns in the spreadsheet represent the Activity name and duration:
 - In the **Select from imported columns:** section, select the **Activity Name Column** and the **Duration Column**. Select **Minutes** as the **Duration Unit**.
 - In the **Map Activity Names:** section, map the Activities in the spreadsheet to those in the Process.

The completed screen should look like this:

New Historical Case Data

Select Parameters

Select time parameter and other parameters which should participate in simulation.

Select from imported columns:

Activity Name Column: Activity Name

Duration Column: Duration

Duration Unit: MINUTE

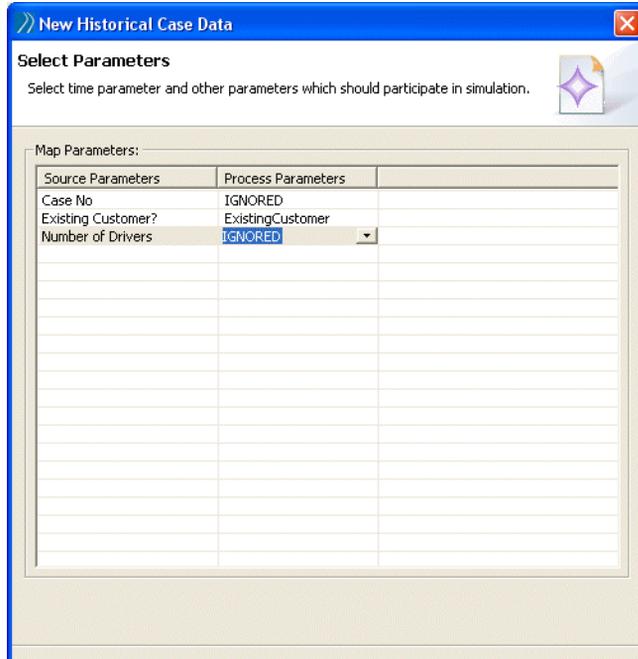
Map Activity Names:

Source Activities	Process Activities
Authorization	Credit Check
Cust Details	Take Customer ...
Quote	Quote

Click **Next**.

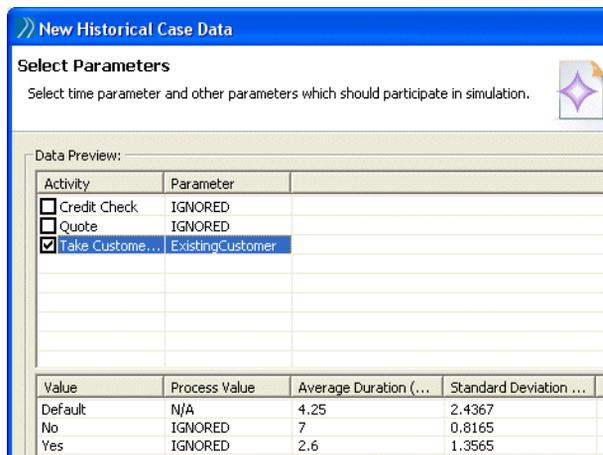
- The next dialog allows you to map any parameters not already used in the previous dialog onto Activities in the Process. In this example, there are three parameters left over, **Case No**, **Existing Customer** and **Number of Drivers**. In this example, we will ignore the Case No and Number of Drivers Parameters. The Existing Customer

parameter is interesting to us because it affects what information is required for the Take Customer Details Activity. Map the parameters as follows:



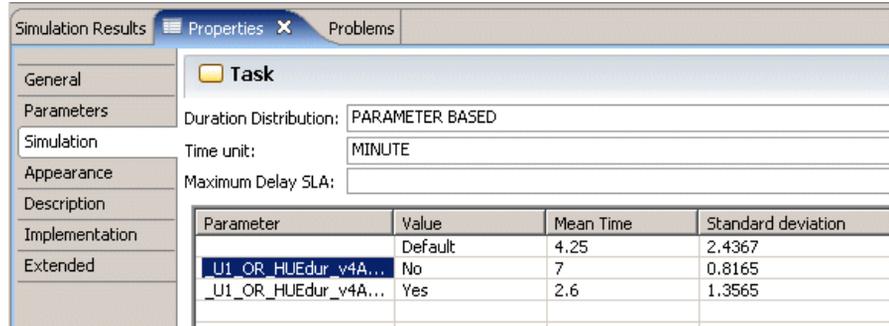
Click **Next**.

- In the next dialog, specify that the Take Customer Details Activity takes its duration from the imported data, depending on the value of the Existing Customer Parameter (YES or NO). Clicking on each row gives the values, average duration and deviation from the average from the spreadsheet. For example:



Click **Finish**.

8. The Simulation Properties view for the Take Customer Details Activity now shows that the duration is taken from the imported data and is based on a parameter:



The screenshot shows the 'Task' properties window in a simulation software. The 'Parameters' tab is active, displaying the following settings:

- Duration Distribution: PARAMETER BASED
- Time unit: MINUTE
- Maximum Delay SLA: (empty field)

Below these settings is a table with the following data:

Parameter	Value	Mean Time	Standard deviation
	Default	4.25	2.4367
_U1_OR_HUEdur_v4A...	No	7	0.8165
_U1_OR_HUEdur_v4A...	Yes	2.6	1.3565

Tutorial 9 - Monitoring SLAs

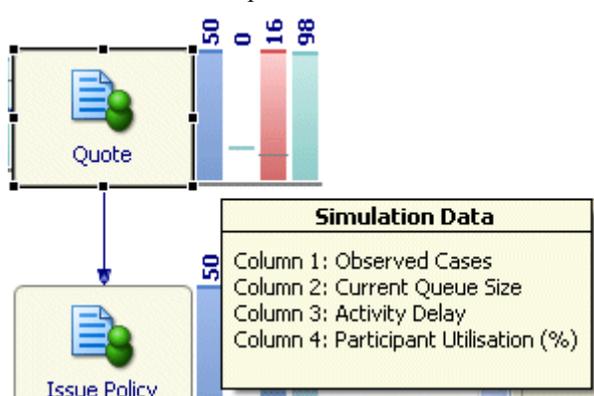
TIBCO Business Studio allows you to set Service Level Agreement (SLA) thresholds for Activity Delay and Participant Utilization. When you simulate the Process, TIBCO Business Studio displays visual cues when these thresholds are exceeded.

1. Open the **Renewal** Process.
2. Click the Quote Activity. In the Properties view, specify **5.5** as the **Maximum Delay SLA**. This means that our SLA specifies that a credit check should take no more than three minutes.
3. In the Project Explorer, click the Insurance Agent Participant. In the Properties view for the Participant, enter 65 for the **Minimum Utilization SLA (%)** and 85 for **Maximum Utilization SLA (%)**. This means that our SLA requires that the Participant be busy at least 65% of the time up to a maximum of 85% of the time.

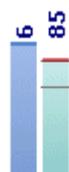


While it is possible to require that the maximum utilization for a Participant is 100%, in practice this is rarely the case because of holiday, ancillary tasks, sickness and so on.

4. Simulate the Process. The SLA information is displayed next to the Activity in the third and fourth columns. For example:

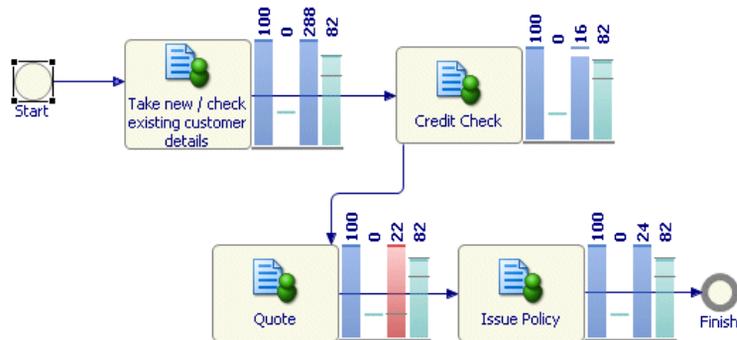


The color of the bar is red in the third column because the SLA is not being met. Specifically the Quote activity is taking longer than we would like it to. In some cases the threshold is displayed in red, but the bar is green like this:



This means that the threshold was exceeded, but the overall utilization was within the SLA.

- In this example, the Renewal Process has 100 instances of the Insurance Agent Participant. By looking at the simulation, we can see that this Participant appears under-utilized (at about 6%). Experiment with changing the number of Insurance Agents. For example, with six Insurance Agents, the results should show utilization within the SLA:



- Looking at the Quote Activity, it has a duration of 4, standard deviation of 1 and a threshold of 5.5. This means that running this simulation results in the average delay exceeding the threshold. Whether this is acceptable is a business specific decision on your part.

Chapter 2 **Concepts and Definitions**

This section of the help defines concepts and terminology related to the TIBCO Business Studio simulation feature.

Topics

- [Activity-Based Costing, page 28](#)
- [Destination Environment, page 29](#)
- [Scenario, page 30](#)
- [Service Level Agreement \(SLA\) on page 31](#)
- [Simulation, page 32](#)
- [Simulation Time, page 33](#)

Activity-Based Costing

Activity-based costing refers to the practice of building up total 'transaction costs' or 'process costs' from the costs of the individual Activity that make up the Process. This can be useful in Business Process Outsourcing situations where a supplier may be paid and have SLAs evaluated on a per transaction basis.

The way this is expressed in TIBCO Business Studio is by assigning a Participant to an Activity. You then assign the Participant a unit cost, and the Activity a duration. TIBCO Business Studio calculates the Activity cost (the Activity duration multiplied by the Participant unit cost) and displays this on the **Simulation** tab of the Properties view of the Activity.

You can generate different reports from the simulation that include activity-based costing data, including participant cost, activity cost and end-to-end process cost (see [Creating and Viewing a Simulation Report on page 53](#)).

Destination Environment

The intended environment in which you want the process to run (for example, BPM or Simulation). You can select this on the Destinations tab of the **Properties** view of a Process. The setting selected affects the validation performed on the Process and consequently the errors or warnings that are displayed in the **Problems** view.



Because of the requirements of different destination environments, a Process that is valid for one destination is not necessarily valid for another.

Scenario

A scenario in TIBCO Business Studio consists of:

- The complete set of data used by TIBCO Business Studio to simulate a Process (for example, the number of Participants, weightings on transitions and so on).
- The Process.
- Simulation results.

You can make several copies of the Package that contains the Process. This allows you to change the simulation data or the Process itself and compare the simulation results.

Service Level Agreement (SLA)

This refers to a contract between a provider of a service and a user of that service that specifies the level of service required during the term of their agreement. Often it also stipulates penalties incurred for not meeting the agreed upon levels of service.

Simulation

Simulation is an abstraction of reality made possible by making assumptions about the real Process. Simulation can then be run to identify areas of the Process that can be improved such as bottlenecks and areas of high cost or delay.

Simulation is by nature an empirical science harnessing the business knowledge and user experience to correctly identify significant factors in the real process.

Simulation Time

Simulation time represents the passage of time during a simulation and accrues based on the durations of the Activities in the Process. You can specify the Date/Time that you want the simulation to begin as well as the speed at which simulation time passes on [Simulation Control View](#).

Simulation time is equivalent to a 37.5 hour work week and excludes weekends. This relates to Participant utilization in that a Participant that is working a full week is considered to be utilized at 100%.

Chapter 3 **Tasks**

This section of the help describes some of the common tasks that you perform using the TIBCO Business Studio simulation feature.

Topics

- [Simulating Business Processes, page 36](#)
- [Simulating Loops in Processes, page 45](#)
- [Using Historical Data for Activity Duration, page 47](#)
- [Controlling Sequence Flow from a Gateway, page 49](#)
- [Monitoring SLAs on page 51](#)
- [Comparing Simulations, page 52](#)
- [Creating and Viewing a Simulation Report, page 53](#)
- [Designing Custom Reports, page 54](#)
- [Customizing Simulation Preferences, page 63](#)

Simulating Business Processes

TIBCO Business Studio has simulation capabilities that make it possible to test and refine business processes before implementation. Simulation is an abstraction of reality made possible by making assumptions about the real Process.

All Activities in your Process must be assigned a duration for simulation purposes and the Participants who perform the Activities assigned unit costs. As a result, metrics such as the cost of an Activity (the Activity duration multiplied by the Participant unit cost) can be calculated.



There is no concept of sub-processes in simulation. If you want to simulate a sub-process, you can either assign it a duration and build this into the entire duration for the process, or you can separate it out as a process, and simulate it individually.

Simulation can then be run to identify areas of the Process that can be improved such as bottlenecks and areas of high cost or delay.

This section describes the steps to simulation:

- Define the "As Is" Process
- Prepare the Simulation
- Run the Simulation of the "As Is" Process
- Interpret the Results of Simulation
- Optimize or Re-Engineer the Process
- Create a "To Be" Process
- Simulate the "To Be" or Optimized Process
- Examine the Results of Simulation
- Build a Business Case for a Process

Define the "As Is" Process

The first step in simulation is to create a model of the current business process using the TIBCO Business Studio modeling features. The model represents a business view of the process as it exists. In some cases processes might be informal. TIBCO Business Studio allows you to take a holistic view of these disparate processes.

When creating the TIBCO Business Studio Process, each time a different person, group, role, or system does something, an Activity is added to the Process.

Activities may be triggered by events such as the receipt of an email, phone call or workflow item, and may involve making a judgement on the presented facts and performing an action (such as entering data to a computer system, phoning someone in the same or different organization, and so on).

Prepare the Simulation

To prepare a Process for simulation, you must do the following:

- [Assign Activity Duration](#)
- [Add the Participants and Associate them with Activities](#)
- [Assign Unit Costs to Participants](#)
- [Add the Data Fields and Associate them with Activities \(optional\)](#)
- [Set the Number of Simulation Cases](#)
- [Set Up Looping Strategies](#)



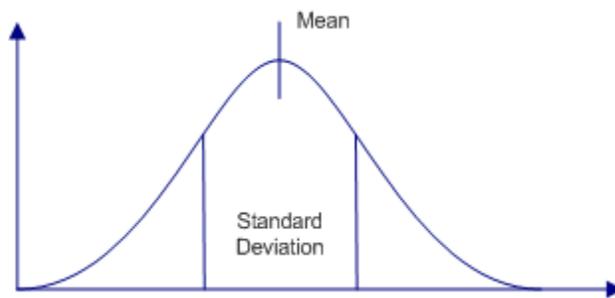
If you have historical data from an actual business process, you can use this as input to the simulation. For more information see [Using Historical Data for Activity Duration on page 47](#).

Assign Activity Duration

As part of simulating the execution of a Process, specify the duration of each Activity in the Process. For example, the duration of support telephone calls might be normally distributed with an average of five \pm two minutes.

1. In the Process Editor, select the **Activity**.
2. In the Properties view, click the **Simulation** tab.
3. Choose a **Duration Distribution**, typically one of the following:
 - **Constant** - choose this distribution for Activities that never vary in duration. For example, a questionnaire might be designed such that it always takes 10 minutes to complete (or rather the variation is so small that it can be considered constant).
 - **Normal** - choose this distribution for Activities which follow a bell curve (you specify the **Mean** and **Standard Deviation**). For example, phone calls in a call

center might follow a standard distribution (68% of all phone calls are 4-6 minutes in duration).



4. Choose a **Time Unit**:
 - Month
 - Day
 - Hour
 - Minute
 - Second
5. Enter the **Value** for the duration.

Add the Participants and Associate them with Activities

All Activities in a Process must have a Participant for simulation purposes. The Participant identifies who or what performs an Activity. For example, 20 call center staff answering enquiries, giving quotes and taking applications and 10 claim handlers processing claims.

In addition to the Participants involved in an Activity, there are broadly two types of resource associated with an Activity:

- blocking resources - a resource that delays the Process when not available (for example, a person needed to do a job)
- non-blocking resources - a resource that doesn't delay the Process, but contribute to costs (for example, the cost of the phone system)



Currently in TIBCO Business Studio you cannot associate non-blocking resources (such as computer time) with an Activity.

To add Participants and associate them with Activities, see the *TIBCO Business Studio Modeling User's Guide*.

Assign Unit Costs to Participants

To simulate the cost of an Activity, you must define the cost of the Participants. This could include costs such as salaries, telephone costs for call centers or travel costs for sales people.

1. In the Project Explorer, select the **Participant**.
2. In the Properties view, click the **Simulation** tab.
3. Enter the **Number Of People/Machines** for the Participant. For example, if the Participant is a field engineer and two are required, enter **2** here.
4. Enter the **Cost Per Unit** and the **Unit**. For example, **30 per Hour**.

Add the Data Fields and Associate them with Activities (optional)

Create the Data Fields used in the Process and associate them with the Activities.

For more information, see the *TIBCO Business Studio Modeling User's Guide*.

Set the Number of Simulation Cases

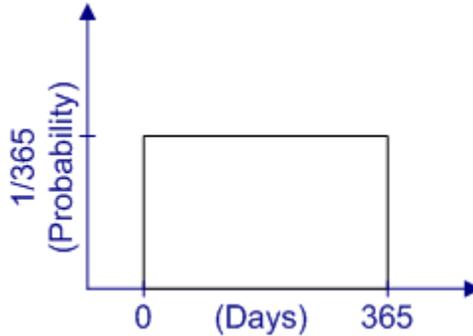
The default number of cases for simulation is 100. You can change this number as follows:

1. In the Process Editor, highlight the **Start** event.
2. In the Properties view, click the **Simulation** tab.
3. Specify the **Number of Cases** you want to run during simulation. Avoid specifying extremely large numbers as this can make simulation time-consuming.

You must also specify a distribution for the interval of case starts, typically one of the following:

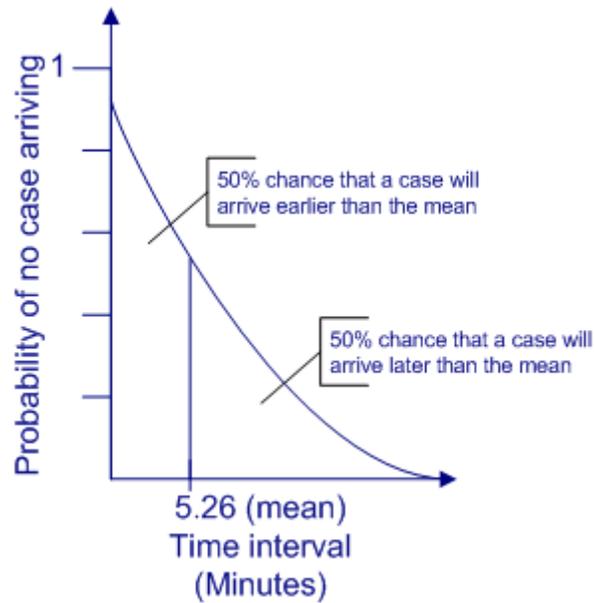
- **Constant** - choose this distribution for case starts that never vary such as the closing of accounts (which happens for example, at the end of every month, quarter and year).
- **Uniform** - choose this distribution for cases that have an equal probability of starting over a given range (for which you can specify a maximum or minimum value). For example, if an audit by a government regulator has an equal chance of happening on

any day of the year, select a uniform distribution with 0 and 365 as minimum and maximum values:



- **Exponential** - use this distribution of for examples such as the following:

We had 100,000 claims last year. There are 525,948 minutes in a year, so we received a claim every 5.26 minutes. The interval between claims arrivals is expressed by a negative exponential distribution:



Set Up Looping Strategies

If there are any loops in your Process (where a Sequence Flow returns to a previous Activity in the Process), you must determine a strategy that allows TIBCO Business Studio to break out of the loop during simulation. For more information, see [Simulating Loops in Processes on page 45](#).

Run the Simulation of the "As Is" Process

1. Ensure that **Simulation** is selected as the Destination Environment:
 - a. Select the Process in the Project Explorer.
 - b. Go to the Properties view and click the **Destinations** tab.
 - c. Select **Simulation** as the Destination Environment.
2. Save the Package that contains the Process.

When you save the Package, validation is performed on the Process to ensure that it can be simulated. Any problems are shown in the Problems view.

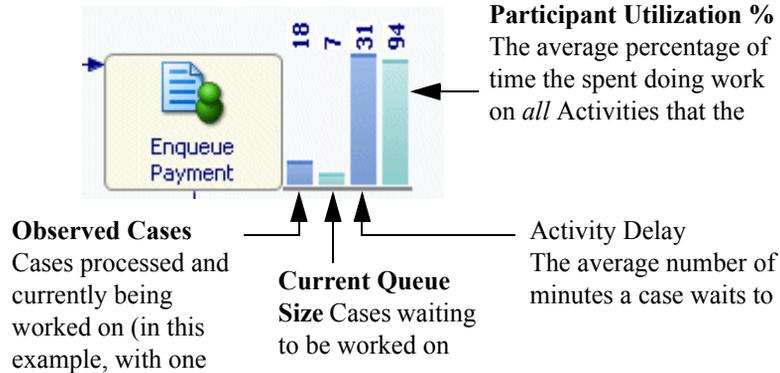
To correct a problem do one of the following:

- Right-click the problem and select **Quick Fix** (if enabled for the current problem). This gives you the option of having TIBCO Business Studio automatically correct the problem for you.
 - Right-click the problem and select **Show in Process Editor**. This displays the Process in the Process Editor, allowing you to manually correct the problem.
3. *Optional* - Set the Simulation Date/Time. By default, this is the current system date/time, but you can set the desired simulation time using the drop-down calendar and by entering a time value.
 4. Right-click the Process and select **Run As > Run Simulation**. If prompted, click **Yes** to switch to the Simulation Perspective.
 5. In the Simulation Control view, click  to start the simulation.
 6. The Simulation Control view shows the simulation progress and the Simulation Results view displays updated simulation data about the cost of the Activities, and so on. The default number of cases for simulation is 100, however this can be configured (see [Set the Number of Simulation Cases on page 39](#)).

View the Simulation Progress

While a simulation is running, you can view information about its progress:

- The Simulation Control view shows a running total of the number of minutes in **Simulation Time**. If the simulation is running too slowly or quickly, you can adjust the **Simulation Speed** in this view.
- The Simulation Results view continuously updates as the simulation runs, displaying simulation data about the **Cases**, **Participants** and **Activities**.
- The Process displays a visual indication of the number of **Observed Cases**, **Current Queue Size**, **Activity Delay** and **Participant Utilization %** as the simulation progresses:



The indication of case totals becomes red if the number of cases passing through an Activity exceed the total number of cases (for example because of looping).

Interpret the Results of Simulation

After running a simulation, the Simulation Results view shows information about the following:

- **Cases** - a summary of the simulation, including the number of cases started and finished as well as case times (average, minimum and maximum).
- **Participants** - information about Participants. For example:

Simulation Results		Properties	Problems			
Cases		Name	Count	Current Idle C...	Average Idle C...	Average Idle Ti...
Cost		Call Center O...	3	3	0.66699	141963.4738
Participants		Claims Handler	10	10	2.16604	1281.6455
Activities		Loss Adjuster	2	2	0.43318	133562.1585

- **Activities** - information about the cost of Activities, distribution into queues, wait times, and so on.

For more information, see [Simulation Results View on page 69](#).

You can also view this information by exporting the simulation data to an HTML report. See [Creating and Viewing a Simulation Report on page 53](#).

At this stage, the goal is to ensure that the "as is" process has sufficient detail to adequately reflect reality. One way of checking this is to compare the results of the simulation to any real data that is available. For example, a call center might have data about average call times, or the time it takes to resolve a problem.

After you have re-worked the model, re-run the simulation as needed.

Optimize or Re-Engineer the Process

After simulating the "as is" Process, you must decide whether minor changes to the original Process can achieve the desired results, or if the Process must be re-engineered.

Optimizing the Process

If minor changes are all that is need to the original Process, you can work on that directly.

Identify bottlenecks/areas for improvement in the Process. For example, long queues or extreme idle times for Participants might be cause for concern.

Create a "To Be" Process

If you decide to re-engineer your process, the "to be" Process represents an alternative to the current process. One approach is to create several "to be" Processes, simulate them and choose the best one. You can either create a new Process or modify a copy of the "as is" Process and prepare it for simulation as described in [Prepare the Simulation](#).

By changing properties in the Process such as the number of Participants or by changing the Process itself, you can re-run the simulation and see the effect of your changes.

Simulate the "To Be" or Optimized Process

Run the simulation in the same way as you simulated the "as is" Process. The goal of this is to get results that you can compare to the results of the "as is" Process.

Examine the Results of Simulation

Compare the "as is" Process to the "to be" or optimized Process. One of the ways you can do this is by using the Simulation Report view (see [Comparing Simulations on page 52](#)).



When comparing Processes you should keep in mind what has changed between the Processes. For example, if you are comparing two Processes that are identical except for the number of Participants assigned to an Activity, it is easy to explain the different simulation results. However when comparing two radically different Processes it can be difficult to identify what accounts for varying simulation results.

Identify any areas where the Process could be improved, re-work the Process and re-run the simulation as needed.

Build a Business Case for a Process

As a result of simulations in TIBCO Business Studio, you should be able to either optimize or re-engineer a Process to demonstrate substantial cost-savings. However, there is usually a cost associated changing existing Processes. This cost must be balanced against the case for change.

For example, suppose that simulations of the "as is" Processes of a support center show that the problem reporting area of the support web site is under utilized. Furthermore, simulations of "to be" Processes show substantial savings could be made by handling 50 percent more support enquiries via the web site.

However, there are costs associated with realizing the promised savings. Customers must be encouraged to use the web site to report problems if any savings are to be made, so an investment must be made in raising customer awareness. Support staff would be under utilized in proportion to the increased usage of the web site, so they must be better utilized, perhaps by taking on outside business from other companies.

Simulating Loops in Processes

When simulating a Process you should avoid infinite loops. If you create a loop without a Simulation Control, TIBCO Business Studio reports this as an error in the Problems view and you cannot perform simulation until you correct this. This section shows how to use a loop in Process simulation.



TIBCO Business Studio supports looping in simulation when the loop is created using a Sequence Flow. However, a Loop Activity Marker is not supported for simulation.

1. Click the Activity in the loop for which you want to add a simulation control. In the Properties view, click the Simulation Control tab.



You must add a simulation control to at least one Activity in the loop; otherwise TIBCO Business Studio generates an error in the Problems view.

2. Click **simulation control** to add a Simulation control strategy.
3. There are three strategies from which you can select to break out of the loop:
 - **Max Loop Count** - after the specified number of times through it. You must enter the **Max Loop Count** (the number of times you want cases to follow the loop).
 - **Max Elapse Time** - after the specified amount of simulation time has elapsed. You must specify a **Time Unit** and **Value**.
 - **Normal Distribution** - based on a normal distribution of times through it. You must enter a **Min Loop Count** and **Max Loop Count** upon which to base the distribution.
4. For each strategy, you must specify the following:
 - **Decision Activity** - This informs TIBCO Business Studio which Flow Object will be used to decide whether to end the loop.
 - **To Activity** - This informs TIBCO Business Studio which Activity to proceed with once the loop is finished.
5. Save the Package containing the Process.
6. Highlight the Process, right-click and select **Run As > Run Simulation**.

7. You should see that the Process breaks out of any loops using the strategy that you specified.



If you have not created the Simulation control strategy correctly TIBCO Business Studio reports this in the Problems view and you cannot perform simulation until the problem is corrected.

Using Historical Data for Activity Duration

As part of setting up a Process for simulation, you specify the duration of the Activities in the Process using a mathematical distribution (for example, Normal distribution). Alternatively, TIBCO Business Studio allows you to import any real historical data (for example, from log files) that you have about activity duration.

Task A Create the Import File

Create an Excel spreadsheet with the data that you want to import. The first row of cells corresponds to the parameter names. Each column under the first row represents the parameter values you wish to import. For example:

	A	B	C	D	E
1	Case Number	Activity Name	Duration	Existing Customer?	Number of Drivers
2	101	Cust Details	1	Yes	1
3	101	Authorization	0	Yes	1
4	101	Quote	3	Yes	1
5	102	Cust Details	3	Yes	2
6	102	Authorization	0	Yes	2
7	102	Quote	5	Yes	2
8	103	Cust Details	7	No	1
9	103	Authorization	2	No	1
10	103	Quote	3	No	1

In this example, the parameter Existing Customer? can have the values **Yes** or **No**.



Note the following requirements for the spreadsheet that you use for data import:

- The spreadsheet must have columns for Activity Name and Duration (though not necessarily with those names).
- You can include any number of other columns for import, but be careful to avoid stray data in columns that you do not plan to import.
- Data from the first worksheet is imported; other worksheets are ignored.

Task B Import the Data

To import the spreadsheet containing your historical data, do the following:

1. Right-click the Process and select **Import**.
2. Select **Historical Case Data (Activity Duration)**.
3. The names of the Project, Package and Process are displayed. Click **Next**.
4. Either click **Browse** or **Browse Workspace** to locate the Excel file. Press the **Tab** key (this activates the Next button). Click **Next**.

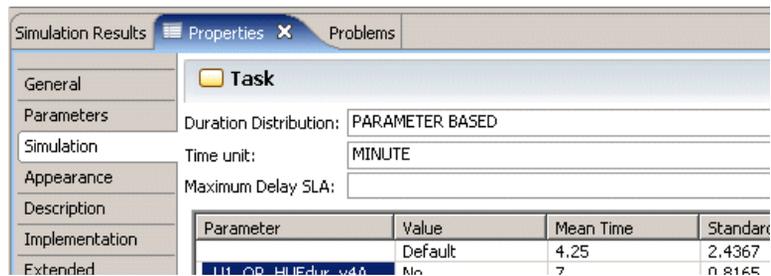
5. The **Select Parameters** dialog is displayed.
 - Select the parameter that represents the Activity Name.
 - Select the parameter that represents the Activity Duration.
 - In the **Map Activity Names:** section, map the Activities in the spreadsheet to those in the Process.

Click **Next**.

6. The next dialog allows you to map any parameters not already used in the previous dialog onto Activities in the Process. Click **Next**.
7. For each Activity, there are three options for where the duration data is taken:
 - use the data specified in the process rather than the imported data - do not select the Activity.
 - use the imported data to create a normal distribution - select the Activity, but select **IGNORED**.
 - use the imported data, depending on a parameter setting - select the Activity and select the Parameter that will be used to determine which values to use.

Clicking on each row gives the values, average duration and deviation from the average.

8. Click **Finish**.
9. The Simulation Properties view for Activities for which the duration is taken from the imported data show information about the parameter names and values. For example:



Controlling Sequence Flow from a Gateway

You can control flow from a Gateway by creating a Parameter and values to be used as in a Rule. On a conditional Sequence Flow exiting the Gateway, you can specify that the Sequence Flow is followed only when values for that Parameter match the expression specified in the Rule.

Task A Create the Parameter

1. Under the Process, right-click **Parameters** and select **New Parameter**.
2. Click **Next** to accept the default Project, Package and Process.
3. Enter the **Name** of the Parameter and its **Type**.
4. Click **Finish** to save the Parameter.

Task B Add Values to the Parameter

1. Highlight the Process and in the Properties view, click the Simulation tab.
2. Highlight the Parameter that you created, and click **Add Value...**
3. A new value with the name "New Value" is added under the Parameter. Double-click the name to rename the value.

You can also remove values by selecting them and clicking **Remove...**

Task C Associate the Parameter with a Gateway



If you change an existing Parameter that is associated with a Gateway, you must also specify a new value for the conditional Sequence Flow (as described in the following task).

1. Open the Process and click the Rule Parameter tab.
2. Enter the name of the Parameter that you created earlier.

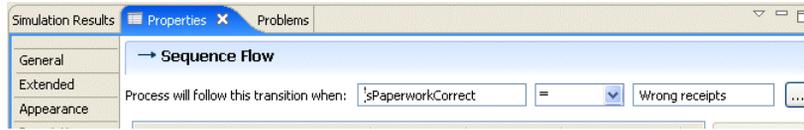


Instead of entering the name of the Parameter, you can use an Eclipse feature called Content Assist. Hold down the **Ctrl** key and press the **spacebar**. This allows you to select from the available Parameters.

Task D Specify a Value for the Conditional Sequence Flow

1. Highlight the Conditional Sequence Flow leaving the Gateway.

- In the Properties view, click the Rule tab. This allows you to create an expression using your Parameter and values. For example:



This shows that this Sequence Flow is only traversed when the **isPaperworkCorrect** Parameter has the value **Wrong receipts**. Any cases with other values for this Parameter will follow the default Sequence Flow.

Monitoring SLAs

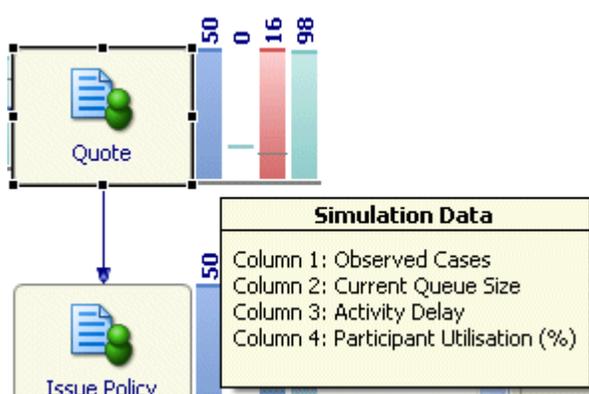
TIBCO Business Studio allows you to set Service Level Agreement (SLA) thresholds for Activity Delay and Participant Utilization. When you simulate the Process, TIBCO Business Studio displays visual cues when these thresholds are exceeded.

1. Open the Process.
2. Click an Activity for which you want to specify a maximum delay. In the Properties view, specify the **Maximum Delay SLA**.
3. In the Project Explorer, click a Participant for whom you want to specify a utilization. In the Properties view for the Participant, enter the **Minimum Utilization SLA (%)** and the **Maximum Utilization SLA (%)**.



While it is possible to require that a Participant is 100% utilized, in practice this is rarely the case because of holidays, ancillary tasks, sickness and so on.

4. Simulate the Process. The SLA information is displayed next to the Activity in the third and fourth columns. For example:



The color of the bar is red in the third column because the SLA is not being met. In some cases the threshold is displayed in red, but the bar is green like this:



This means that the threshold was exceeded, but the overall utilization was within the SLA.

Comparing Simulations

Often you want to compare the results of a simulation with another set of results, for example if you are fine tuning a Process or if you are making a business case for changing an existing Process. TIBCO Business Studio provides a Simulation Report view that allows you to do this.

1. Select the set of results that you want to compare. Either:
 - In the Project Explorer, right-click the Process for which you want to compare results and select **Compare Simulation Results**. This opens the **Simulation Report** view with the results associated with the Process.
 - In the Project Explorer, expand the **Simulation** folder and its sub-folders and select the relevant **.sim** files that were created when you simulated the process (for example, 2006-03-11_15-56-38.sim).



The filename of the simulation results file is automatically generated. It is easier to keep track of several simulation results files if you rename them to use more meaningful names by selecting the file and **Refactor > Rename**.

Select the two sets of results that you want to compare.

2. There are two pre-defined report types that you can use to create your reports:
 - **Case Cost-Time Analysis** - shows charts and tables that display such information as the minimum, average and maximum case times for each experiment.
 - **Participant Utilization** - shows charts that display idle time for the Participants in the process.
3. Select a report type and click **Display Report**. For more information about the Reports that are generated, see [Compare Simulation Results View on page 74](#).

Creating and Viewing a Simulation Report

You can create a report in HTML format that contains the results of a simulation. The report contains the following:

- **Cases** - a summary of the simulation
- **Participants** - information about Participants (for example, idle time)
- **Activities** - information about the cost of Activities, distribution into queues, wait times, and so on.

Create the report as follows:

1. From the Simulation Results view, click  in the upper right of the view.
2. In the Simulation Report view, you can view the report.
3. The HTML file of the report is also saved to the Simulation folder where the Project is located.

Designing Custom Reports

TIBCO Business Studio allows you to create your own custom reports with the Eclipse Business Intelligence and Reporting Tools (BIRT). BIRT is an open source, Eclipse-based reporting system that allows you to produce HTML and PDF reports. The reports displayed in the [Compare Simulation Results View on page 74](#) are examples of BIRT reports provided by TIBCO.

BIRT is provided with TIBCO Business Studio, and you can use it to design and run your report. For more information refer to the Eclipse BIRT documentation. When you design your report, make sure to use **.sim** files as a data source (**.sim** files are XML files that contain the results of simulation comparison in TIBCO Business Studio).

This section describes how to create a new BIRT report for use in the Compare Simulation Results editor. This report is a simple table. To create the report follow the steps in this section:

- [Obtain a Data Source, page 54](#)
- [Create a New Report](#)
- [Create the Data Source](#)
- [Create the Data Set](#)
- [Create the Report Parameters](#)
- [Create a Table to Display the Data](#)
- [Import the Report](#)

For more information about the different types of reports that you can create, refer to the Eclipse BIRT documentation.

Obtain a Data Source

To create a new BIRT report, you will need a sample XML data source file. Even though it has the same file extension, this is not the same as the **.sim** result files. You can obtain a sample data source using either of the following methods:

- In the Compare Simulation Results view, generate a BIRT report with one of the built-in reports. This generates a data file *current workspace\metadata\plugins\com.tibco.xpd.simulation.compare\temp\results.sim*.
- Alternatively, locate the file **Studio\3.3\studio-addins\eclipse\plugins\com.tibco.xpd.simulation.compare_versemon.jar**. Open it in WinZip and extract the file **sample.sim**.

Create a New Report

After you have obtained a sample data source file, create the report as follows.

1. Locate a folder in the Project Explorer to store the new BIRT report.
2. Right-click the folder and select **New > Other**.
In the **New** wizard expand **Business Intelligence and Reporting Tools**, select **Report**, and click **Next**.
3. Enter a file name for the report using the **.rptdesign** file extension, then click **Finish** to start with a blank report.
4. The Report editor opens with the new report and you are prompted to change to the Report Design perspective.

Create the Data Source

To access data for a BIRT report, you must use a BIRT data source. A BIRT data source is an object that contains connection parameters.

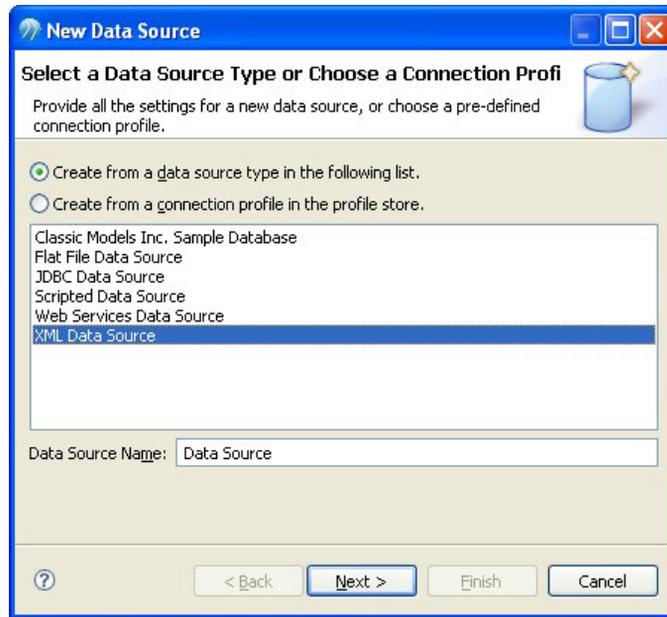


Before creating a data source or multiple sources for your first reports, consider the issues of project and resource organization. If you plan to reuse a data source in multiple report projects, you can create that data source in a library and reuse that data source from the library. The advantage of this approach is that updates to the BIRT data source in the library are subsequently available to all reports that use the library.

Use the Data Explorer, as described in this section, to create and manage BIRT data sources. BIRT Report Designer supports using multiple data sources for the report design. The data sources can be of different types. For example, you can use data from an RDBMS database and data from a flat file repository in the same report design. In this example, the data is extracted from the sample XML data source file.

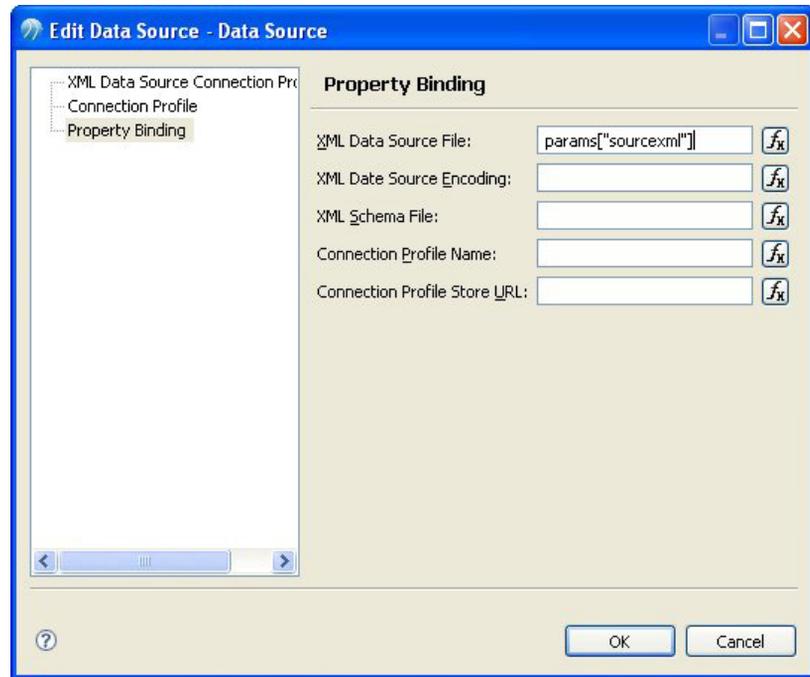
1. In the Data Explorer view, right-click **Data Sources** and select **New Data Source**.

2. Select **XML Data Source**, enter a name for the data source, and click **Next**.



3. Select the sample data source file (obtained in [Obtain a Data Source on page 54](#)):
 - a. Click **Browse** (to the right of the upper text entry field).
 - b. In the **Open** dialog, change the **Files of type** filter from ***.xml** to ***.***.
 - c. Select the sample data source file (obtained in [Obtain a Data Source on page 54](#)), and click **Finish**.
4. In the Data Explorer view, double-click the newly created data source in the and select **Property Binding**.

In the **XML Data Source File** field, enter `params["sourcexml"]` and click **OK**.



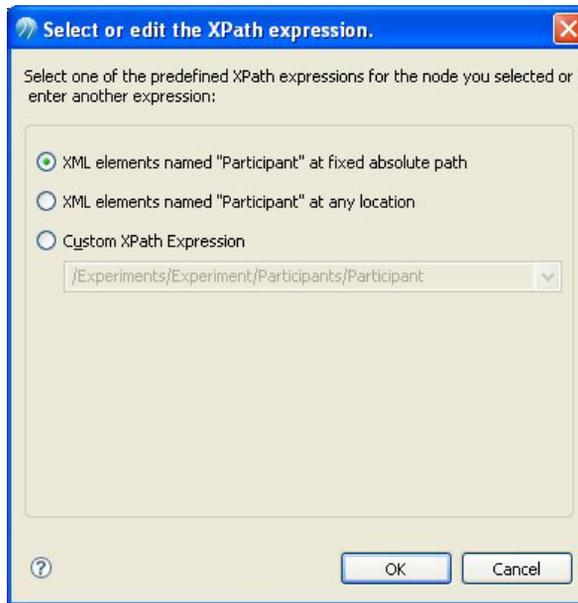
The parameter (`params["sourcexml"]`) is passed to the report at runtime.

Create the Data Set

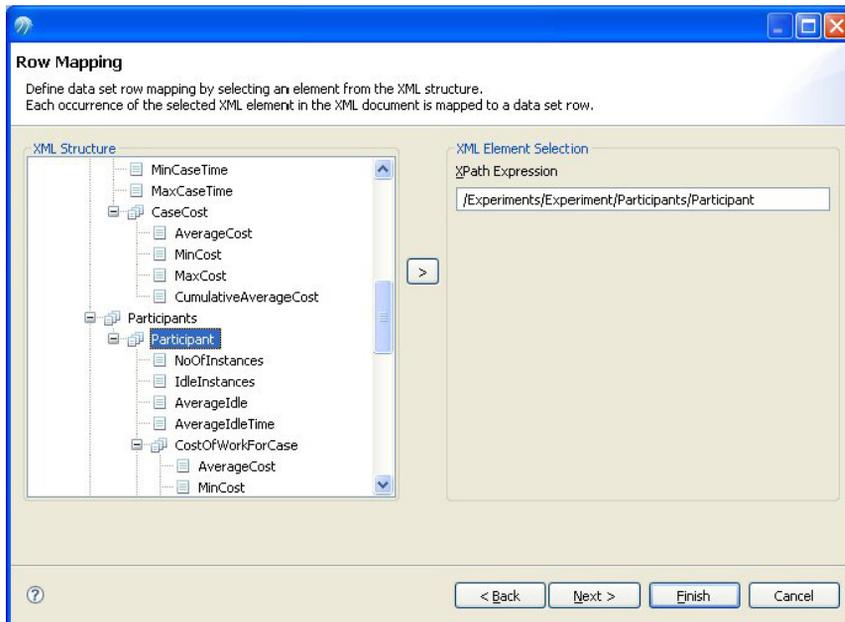
A data set identifies the data to retrieve from the data source.

1. In the Data Explorer view, right-click **Data Sets** and select **New Data Set**.
2. Enter a name for the data set and click **Next**.
3. In the **Sample XML Settings** dialog, click **Next** to accept the default settings.

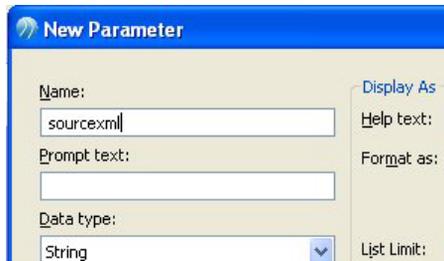
- On the **Row Mapping** dialog, select Participant, and click the central arrow button to set the XPath expression. Accept the default XPath expression in the resulting dialog and click **OK**:



- The **Row Mapping** dialog should look like this:



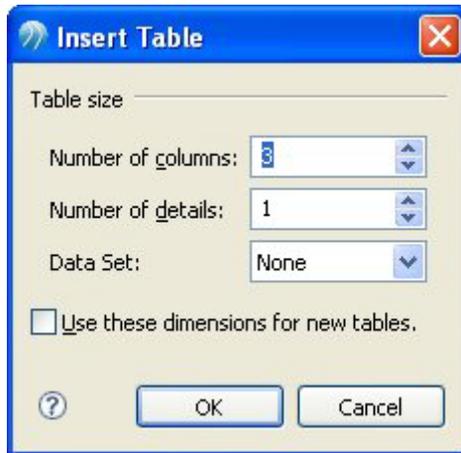
2. Give the parameter the name **sourcexml** then click **OK**.



Create a Table to Display the Data

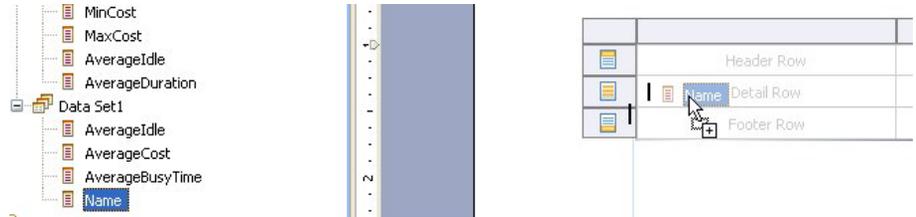
In this task, create a table to display the data from the data set that you created previously. You start by inserting a table element, then you insert data elements in the table.

1. In the Report Design perspective, select **Window > Show View > Palette**.
2. From the Palette, drag a table element onto the report. Click **OK** in the following dialog to create a three column table:



3. Return to the Data Explorer (select **Window > Show View > Data Explorer**).

4. Drag the Name from the Data Explorer to the detail row of the first column of the table:



5. Similarly drag **AverageIdle** and **AverageBusyTime** to the detail rows of the second and third columns. The header rows are filled in automatically and the table looks like this:

Name	AverageIdle	AverageBusyTime
[Name]	[AverageIdle]	[AverageBusyTime]
Footer Row		

Import the Report

1. Select **Window > Preferences**, and then select **Simulation > Report Management**.
2. Click **Import**.



You can also import a simulation comparison report by selecting the **File > Import > Business Process Management > Simulation Comparison** report menu.

3. Give the report a name, use the **Browse Workspace** button to locate the report file, and click **OK**.
4. The newly-created report now appears in the Compare Simulation Results view.
5. Select the report, select some simulation results files (**.sim** files), and click the **Display Report** button in the Compare Simulation Results view. For example:

Name	AverageIdle	AverageBusyTime
Loss Adjuster	0.43315	7568.8001
Claims Handler	2.1663	142309.9482
Call Center Operator	0.66602	1652.1252
26 Mar 2009 16:55		

6. The report can be edited, and the new data set is available to use in charts and tables that are added to the report. The actual results file is substituted in and used for the

data set when the report is run. For more information about changing the report, refer to the BIRT documentation.

Editing the Report

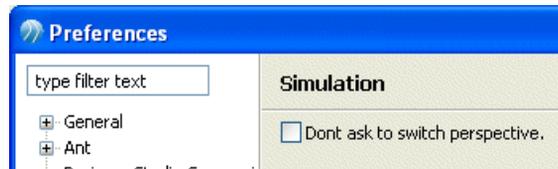
With the report added to your workspace and available in the Compare Simulation Results view, you can customize the report to suit your needs. To customize the report, do the following:

1. Edit the report in the Report Design view.
2. Save the report.
3. Click the **Display Report** button in the Compare Simulation Results view to see the effect of your changes on a report generated from real data.

Customizing Simulation Preferences

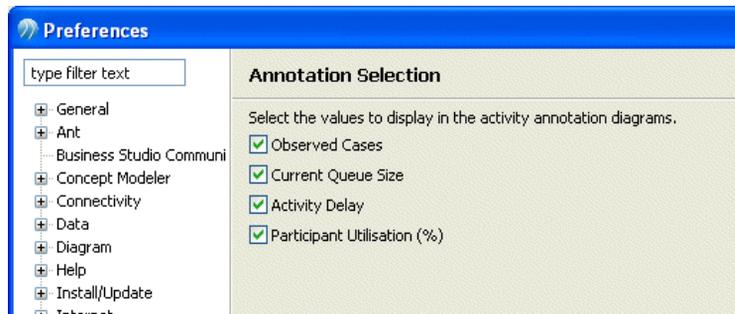
You can customize the annotation selections, report management, and validation that is performed for simulation. For validation errors you can specify its severity level as **Error**, **Warning**, **Info**, or **Ignore**. To customize the Simulation preferences, do the following:

1. Select **Window > Preferences**.
2. Select **Simulation**. The following dialog is displayed:



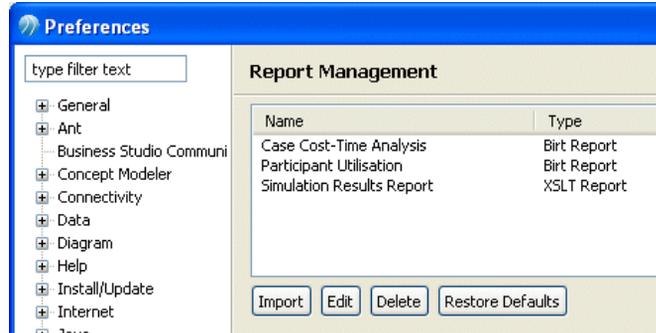
This allows you to control whether you are prompted to confirm changing the perspective when you run simulation. If desired, change the setting and click **Apply**.

3. Expand **Simulation** and click **Annotation Selection**. The following dialog is displayed:



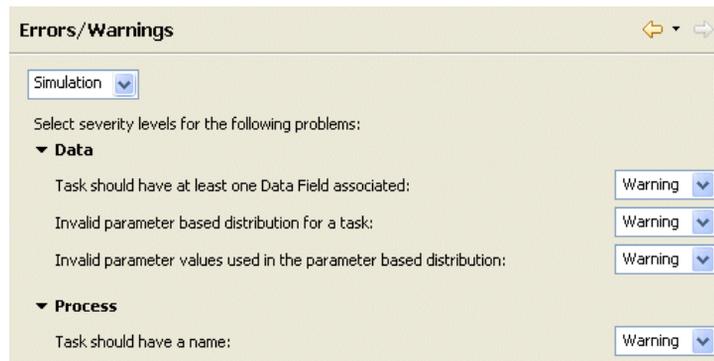
This allows you to customize the annotations that are displayed when the Process is being simulated. For an explanation of these annotations see [View the Simulation Progress on page 41](#). If desired, change the settings and click **Apply**.

- Expand **Simulation** and click **Report Management**. The following dialog is displayed:



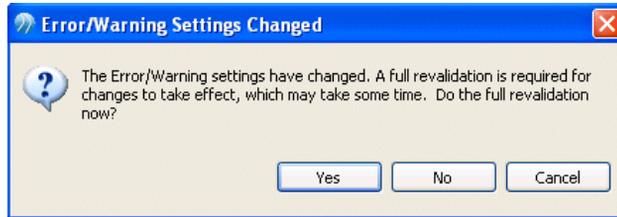
This dialog allows you to edit, delete or import reports to be used with simulation. For more information see [Designing Custom Reports on page 54](#).

- Expand **Process Editor** and select **Errors/Warnings**. From the drop-down list, select **Simulation**. The following dialog is displayed:



- If you want to change the severity level for a Simulation problem, select from the drop-down list. When you have finished, click **Apply** to effect any changes you have made.

7. The following dialog is displayed:



- Click **Yes** to revalidate your workspace. Depending on the size of the workspace and the number of errors, there is a delay while the revalidation occurs.
- Click **No** to revalidate your workspace later. The revalidation will take place when the concept file next changes or is saved, or when you explicitly request a rebuild of the project or workspace.
- Click **Cancel** if you do not wish to apply your changes.

Chapter 4 **Reference**

This section of the help describes the major parts of the TIBCO Business Studio user interface that are related to simulation.

In Eclipse, a Perspective includes the views and set of editors that you commonly use for a specific type of work. TIBCO has created several TIBCO Business Studio perspectives that include the views and editors you commonly use when creating and simulating business processes. This chapter describes the views contained in the **Simulation Perspective**.

Topics

- [Simulation Control View, page 68](#)
- [Simulation Results View, page 69](#)
- [Simulation Report View on page 72](#)
- [Simulation Properties View, page 73](#)
- [Compare Simulation Results View, page 74](#)
- [Simulation Data, page 76](#)

Simulation Control View

This view contains a toolbar that allows you to pause, resume or stop a running simulation. It also shows the following:

- **Process name** - name of the Process used to run the simulation.
- **Simulation speed** - a slider for increasing or decreasing the rate at which the simulation executes.
- **Simulation progress** - a visual representation of the number of simulation cases run against the number of cases to be run.
- **Simulation time** - the number of minutes that have elapsed since the start of the simulation.
- **Start time** - the date/time (in simulated, not real time) that you want the simulation to begin (once the simulation starts you cannot modify the **Start time**).
- **Current time** - the date/time the simulation finishes (Start time + Elapsed time)

Simulation Results View

This view shows simulation data about running and completed simulations. It displays information about the cost of Activities such as the average cost, minimum and maximum cost and so on:

Cases

Property	Meaning
Started Cases	The number of cases started. This is configured on the Simulation properties of the Start event.
Finished Cases	The number of cases completed. When the simulation runs to completion, this should equal the number of cases started.
Average Case Time	The average time it takes to complete a case. The time unit is configured on the Simulation properties of the Start event.
Min. Case Time	The fastest that a case was processed.
Max. Case Time	The longest a case took to be processed.
Average Cost	The average cost of a Case in the Process (based on the Participant Costs and Activity Durations).
Min. Cost	The lowest cost case of the simulation run.
Max. Cost	The highest cost case of the simulation run.
Cumulative Cost	The total cost of all the cases in the simulation run.

Participants

Property	Meaning
Name	Name of the Participant.
Count	Number of Participants (specified on the Simulation properties of the Participant).
Current Idle Count	Number of Idle Participants (for example, if you pause the simulation before it finishes).
Average Idle Count	Average number of idle Participants.
Average Idle Time	Average amount of time the Participant spent not handling a case.

Activities

Property	Meaning
Name	Name of the Activity.
Processed Cases	Number of cases processed by this Activity.
Current Queue Size	Number of cases currently queued for this Activity.
Max Queue Size	The maximum number of cases that were queued for this Activity.
Average Queue Size	The average number of cases that were queued for this Activity.
Average Wait	The average time a case spends queued.
Average Cost	The average cost of an Activity (calculated using the cost of the Participant and the time spent on the Activity).
Min Cost	The lowest Activity cost.
Max Cost	The highest Activity cost.
Cumulative Cost	The total cost of the Activity to that point in the simulation (calculated by multiplying the average cost times the number of cases).

Simulation Report View

This view displays an HTML report of a simulation run. To view a report, you must first create one (see [Creating and Viewing a Simulation Report on page 53](#)).

Simulation Properties View

When you display a Process in TIBCO Business Studio and click in the white area of the Lane, the Properties view for the Process itself is displayed. Click the **Simulation** tab, and you can view information about the simulation data for the Process. For example:

Flow (From/To)	Weighting f...	Percentage	Transitions
0 : (transitionId=3)	200.0	67.1 %	g1 to a2
1 : (transitionId=4)	98.0	32.9 %	g1 to a3

This shows that the gateway **g1** has two output Sequence Flows (**Id 3** and **Id 4**) and that one will pass 67.1% of the cases and the other 32.9%. The percentages are calculated automatically based on the weighting that you enter.

The weighting can either be:

- a number related to the total number of cases you want to simulate. For example of a total of 100 cases the weighting could be specified as 67:33.
- based upon a known weighting regardless of the total number of cases, as illustrated in the previous example, where the weighting is 200:98.

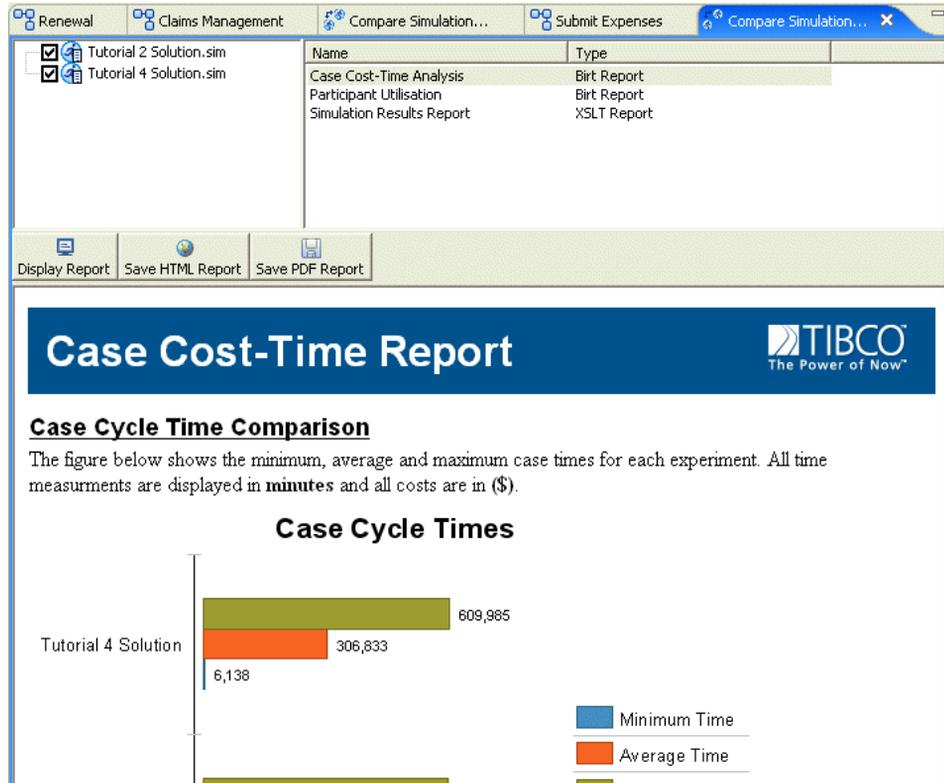
In either case, the weighting is simply converted to a percentage of the total weighting and used by the simulation engine.

The simulation parameters in the Simulation Properties view do not necessarily correspond exactly to the Process itself. For example, if you delete a Gateway or a Sequence Flow from your Process, the simulation parameters for these objects are retained in the Simulation Properties view. This is because you may still want to manipulate these parameters for the purposes of simulation.

You can delete simulation parameters that are no longer relevant to your Process by right-clicking them and selecting **Delete**. If you mistakenly delete a parameter that is still needed for simulation, TIBCO Business Studio re-creates this parameter when you re-run the simulation, however the parameter is re-created with the default weighting (any weighting changes you have made are lost).

Compare Simulation Results View

This view allows you to create comparisons based on one or more sets of simulation results. For example:



The screenshot displays the 'Compare Simulation Results View' in TIBCO Business Studio. The interface includes a toolbar with 'Display Report', 'Save HTML Report', and 'Save PDF Report' buttons. Below the toolbar is a 'Case Cost-Time Report' section with a 'Case Cycle Time Comparison' chart. The chart shows data for 'Tutorial 4 Solution' with values 6,138, 306,833, and 609,985. A legend indicates 'Minimum Time' (blue), 'Average Time' (orange), and 'Maximum Time' (green).

Name	Type
Case Cost-Time Analysis	Birt Report
Participant Utilisation	Birt Report
Simulation Results Report	XSLT Report

Case Cycle Time Comparison

The figure below shows the minimum, average and maximum case times for each experiment. All time measurements are displayed in **minutes** and all costs are in (\$).

Case Cycle Times

Experiment	Minimum Time (minutes)	Average Time (minutes)	Maximum Time (minutes)
Tutorial 4 Solution	6,138	306,833	609,985

Legend:

- Minimum Time (Blue)
- Average Time (Orange)
- Maximum Time (Green)

The following sections discuss the comparison tools.

Case Cost-Time Analysis

This comparison tool shows information about the time it takes for a case to complete (the cycle time) and also about the cost of cases.

Name	Description
Case Cycle Time Comparison	This is a bar chart that shows the minimum, average and maximum case cycle times. This is useful if you are modifying a Process with the goal of reducing one of these measures (for example, a call center that wants to reduce the average time each call takes).
Case Time Comparison to <i>Process</i>	This table shows the average case time for each simulation and displays the percent change against the first Process that you selected.
Case Cost Comparison	This bar chart shows the minimum, average and maximum cost for cases. This case cost is calculated based upon the activities performed, their duration and the cost of the Participant performing the activities. This chart can be useful if you are trying to achieve a reduction in case costs, for example by reducing the Activity duration or the cost of Participants.
Case Cost Comparison to <i>Process</i>	This table shows the average case costs for each simulation and the percent change against the first Process that you selected.
Average Cost/Time Comparison	This graph compares the average cost and time of each simulation.

Participant Utilization

This comparison tool shows how much time is spent idle by all the Participants in a simulation and by each Participant.

Name	Description
Resource Idle Time Report	This chart shows how much time is spent idle by Participants in each simulation.
Participant Idle Times by Experiment	This section displays a pie chart showing idle time for each Participant.

Simulation Data

Simulation Data is added to a Process using the Simulation tab on the Activity Properties view, the Start Event Properties view and the Participant Properties view.