



# **TIBCO Business Studio™ Simulation Guide**

*Software Release 4.3*

*April 2019*

## Important Information

SOME TIBCO SOFTWARE EMBEDS OR BUNDLES OTHER TIBCO SOFTWARE. USE OF SUCH EMBEDDED OR BUNDLED TIBCO SOFTWARE IS SOLELY TO ENABLE THE FUNCTIONALITY (OR PROVIDE LIMITED ADD-ON FUNCTIONALITY) OF THE LICENSED TIBCO SOFTWARE. THE EMBEDDED OR BUNDLED SOFTWARE IS NOT LICENSED TO BE USED OR ACCESSED BY ANY OTHER TIBCO SOFTWARE OR FOR ANY OTHER PURPOSE.

USE OF TIBCO SOFTWARE AND THIS DOCUMENT IS SUBJECT TO THE TERMS AND CONDITIONS OF A LICENSE AGREEMENT FOUND IN EITHER A SEPARATELY EXECUTED SOFTWARE LICENSE AGREEMENT, OR, IF THERE IS NO SUCH SEPARATE AGREEMENT, THE CLICKWRAP END USER LICENSE AGREEMENT WHICH IS DISPLAYED DURING DOWNLOAD OR INSTALLATION OF THE SOFTWARE (AND WHICH IS DUPLICATED IN THE LICENSE FILE) OR IF THERE IS NO SUCH SOFTWARE LICENSE AGREEMENT OR CLICKWRAP END USER LICENSE AGREEMENT, THE LICENSE(S) LOCATED IN THE "LICENSE" FILE(S) OF THE SOFTWARE. USE OF THIS DOCUMENT IS SUBJECT TO THOSE TERMS AND CONDITIONS, AND YOUR USE HEREOF SHALL CONSTITUTE ACCEPTANCE OF AND AN AGREEMENT TO BE BOUND BY THE SAME.

ANY SOFTWARE ITEM IDENTIFIED AS THIRD PARTY LIBRARY IS AVAILABLE UNDER SEPARATE SOFTWARE LICENSE TERMS AND IS NOT PART OF A TIBCO PRODUCT. AS SUCH, THESE SOFTWARE ITEMS ARE NOT COVERED BY THE TERMS OF YOUR AGREEMENT WITH TIBCO, INCLUDING ANY TERMS CONCERNING SUPPORT, MAINTENANCE, WARRANTIES, AND INDEMNITIES. DOWNLOAD AND USE OF THESE ITEMS IS SOLELY AT YOUR OWN DISCRETION AND SUBJECT TO THE LICENSE TERMS APPLICABLE TO THEM. BY PROCEEDING TO DOWNLOAD, INSTALL OR USE ANY OF THESE ITEMS, YOU ACKNOWLEDGE THE FOREGOING DISTINCTIONS BETWEEN THESE ITEMS AND TIBCO PRODUCTS.

This document is subject to U.S. and international copyright laws and treaties. No part of this document may be reproduced in any form without the written authorization of TIBCO Software Inc.

TIBCO, Two-Second Advantage, TIBCO Enterprise Message Service, TIBCO Business Studio and TIBCO ActiveMatrix are either registered trademarks or trademarks of TIBCO Software Inc. in the United States and/or other countries.

All other product and company names and marks mentioned in this document are the property of their respective owners and are mentioned for identification purposes only.

This software may be available on multiple operating systems. However, not all operating system platforms for a specific software version are released at the same time. Please see the readme.txt file for the availability of this software version on a specific operating system platform.

THIS DOCUMENT IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT.

THIS DOCUMENT COULD INCLUDE TECHNICAL INACCURACIES OR TYPOGRAPHICAL ERRORS. CHANGES ARE PERIODICALLY ADDED TO THE INFORMATION HEREIN; THESE CHANGES WILL BE INCORPORATED IN NEW EDITIONS OF THIS DOCUMENT. TIBCO SOFTWARE INC. MAY MAKE IMPROVEMENTS AND/OR CHANGES IN THE PRODUCT(S) AND/OR THE PROGRAM(S) DESCRIBED IN THIS DOCUMENT AT ANY TIME.

THE CONTENTS OF THIS DOCUMENT MAY BE MODIFIED AND/OR QUALIFIED, DIRECTLY OR INDIRECTLY, BY OTHER DOCUMENTATION WHICH ACCOMPANIES THIS SOFTWARE, INCLUDING BUT NOT LIMITED TO ANY RELEASE NOTES AND "READ ME" FILES.

This and other products of TIBCO Software Inc. may be covered by registered patents. Please refer to TIBCO's Virtual Patent Marking document (<https://www.tibco.com/patents>) for details.

Copyright © 2004-2019 TIBCO Software Inc. ALL RIGHTS RESERVED.

TIBCO Software Inc. Confidential Information

# Contents

---

<b>TIBCO Documentation and Support Services</b> .....	<b>5</b>
<b>Getting Started with Simulation</b> .....	<b>6</b>
Overview of Simulation .....	6
<b>Concepts and Definitions</b> .....	<b>7</b>
Activity-Based Costing .....	7
Destination Environment .....	7
Scenario .....	7
Service Level Agreement (SLA) .....	7
Simulation .....	7
Simulation Time .....	8
<b>Tasks</b> .....	<b>9</b>
Simulating Business Processes .....	9
Define the As Is Process .....	9
Prepare the Simulation .....	9
Assign Activity Duration .....	9
Add the Participants and Associate them with Activities .....	10
Assign Unit Costs to Participants .....	10
Add the Data Fields and Associate them with Activities (optional) .....	11
Set the Number of Simulation Cases .....	11
Set Up Looping Strategies .....	12
Run the Simulation of the As Is Process .....	12
View the Simulation Progress .....	13
Interpret the Results of Simulation .....	13
Optimize or Re-Engineer the Process .....	13
Using Historical Data for Activity Duration .....	15
Controlling Sequence Flow from a Gateway .....	18
Monitoring SLAs .....	18
Comparing Simulations .....	19
Creating and Viewing a Simulation Report .....	20
Designing Custom Reports .....	20
Obtaining a Data Source .....	21
Creating a New Report .....	21
Creating the Data Source .....	21
Create the Data Set .....	23
Creating the Report Parameters .....	24
Creating a Table to Display the Data .....	24

Importing the Report .....	25
Editing the Report .....	26
Customizing Simulation Preferences .....	26
<b>Reference .....</b>	<b>28</b>
Simulation Control View .....	28
Simulation Results View .....	28
Simulation Report View .....	29
Simulation Properties View .....	30
Compare Simulation Results View .....	30
Case Cost-Time Analysis .....	31
Participant Utilization .....	32
Simulation Data .....	32

# TIBCO Documentation and Support Services

---

## How to Access TIBCO Documentation

Documentation for TIBCO products is available on the TIBCO Product Documentation website, mainly in HTML and PDF formats.

The TIBCO Product Documentation website is updated frequently and is more current than any other documentation included with the product. To access the latest documentation, visit <https://docs.tibco.com>.

## Product-Specific Documentation

Documentation for TIBCO products is not bundled with the software. Instead, it is available on the TIBCO Documentation site. To directly access documentation for this product, double-click the following file:

`TIBCO_HOME/release_notes/TIB_business-studio-bpm-cloud-edition_version_docinfo.html`

The following documents for this product can be found on the TIBCO Documentation site:

- TIBCO Business Studio™ Concepts
- TIBCO Business Studio™ Modeling User's Guide
- TIBCO Business Studio™ - Analyst Edition User's Guide
- TIBCO Business Studio™ - BPM Implementation
- TIBCO Business Studio™ Forms User's Guide
- TIBCO Business Studio™ Simulation User's Guide
- TIBCO Business Studio™ Customization
- TIBCO Business Studio™ - Analyst Edition Installation
- TIBCO Business Studio™ - BPM Edition Installation
- TIBCO Business Studio™ iProcess to BPM Conversion

## How to Contact TIBCO Support

You can contact TIBCO Support in the following ways:

- For an overview of TIBCO Support, visit <http://www.tibco.com/services/support>.
- For accessing the Support Knowledge Base and getting personalized content about products you are interested in, visit the TIBCO Support portal at <https://support.tibco.com>.
- For creating a Support case, you must have a valid maintenance or support contract with TIBCO. You also need a user name and password to log in to <https://support.tibco.com>. If you do not have a user name, you can request one by clicking Register on the website.

## How to Join TIBCO Community

TIBCO Community is the official channel for TIBCO customers, partners, and employee subject matter experts to share and access their collective experience. TIBCO Community offers access to Q&A forums, product wikis, and best practices. It also offers access to extensions, adapters, solution accelerators, and tools that extend and enable customers to gain full value from TIBCO products. In addition, users can submit and vote on feature requests from within the [TIBCO Ideas Portal](#). For a free registration, go to <https://community.tibco.com>.

## Getting Started with Simulation

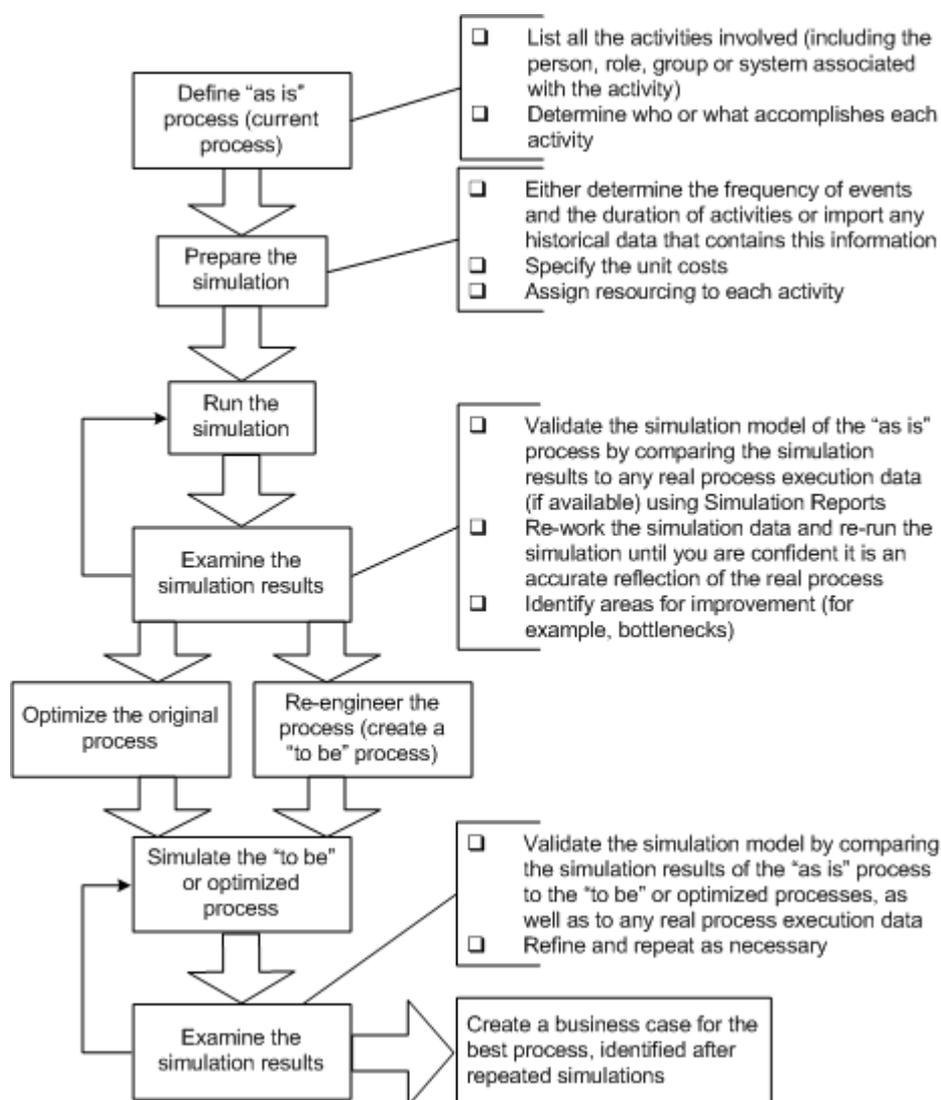
The TIBCO Business Studio simulation features allow you to simulate a Process that has been developed in TIBCO Business Studio to identify areas of the Process that can be improved such as bottlenecks and areas of high cost or reduced service levels.

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.

### Overview of Simulation

The diagram in this topic summarizes the TIBCO Business Studio approach to simulation.

See [Simulating Business Processes](#).



# Concepts and Definitions

---

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

## 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](#)).

## 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 and 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%.

## Tasks

---

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

### 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.

### 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 a number of steps. 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](#).

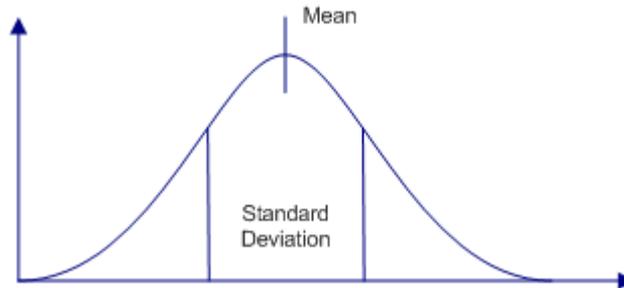
### Assign Activity Duration

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 ± two minutes.

#### Procedure

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.

#### Procedure

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.

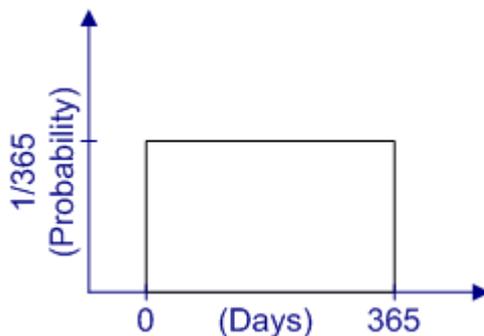
#### Procedure

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.

#### Result

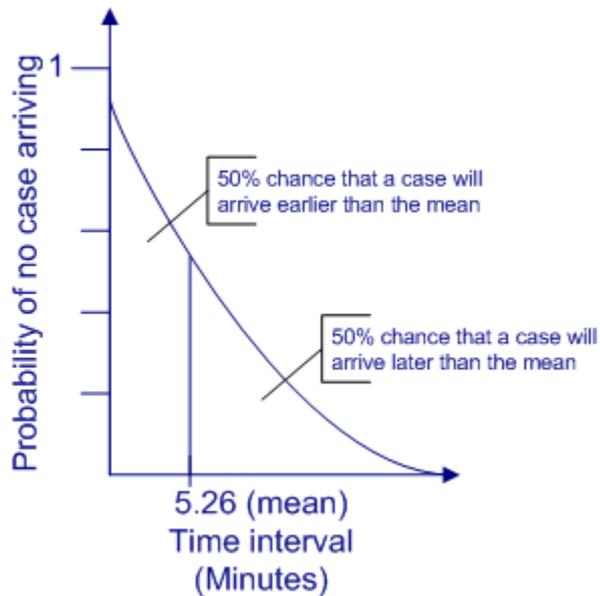
You must also specify a distribution for the interval of case starts, typically one of the following:

- **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.

See [Simulating Loops in Processes](#).

### Run the Simulation of the As Is Process

#### Procedure

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.

In the Simulation Control view, click  to start the simulation.

5. 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](#)).

## 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 cases, participants and activities.

- **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:

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](#).

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

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](#)).



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..



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

The following was deferred in V1.1

TIBCO Business Studio allows you to specify the interval of case starts using mathematical distributions. For example, in a manufacturing environment, a new work piece might arrive on a conveyor belt every five minutes. When simulating this in TIBCO Business Studio, on the simulation properties of the Process, select a **Distribution** of CONSTANT and specify five minutes.

However for more complex simulations, deciding which distribution to use can be difficult. Furthermore real data often exists that is ideal to use. TIBCO Business Studio allows you to import case start data from an Excel spreadsheet. In addition to the data about the interval and timing of case starts, you can import simulation parameters and parameter values.



Using imported data for parameters and parameter values can have unintended effects on Gateways and weightings later in the Process. For example, suppose a Process has two Gateways: one that uses imported historical data and one later in the Process that does not. Any weightings assigned to the first Gateway are ignored and the flow is taken from the actual imported data. The flow at the next gateway is generated from the weighting set in the simulation parameters (for example, 50:50), but because it is randomly generated and receiving actual data that is not random, the distribution after simulation may not be 50:50.

### Create the Import File

The first step is to obtain the data you want to import. The format of the file that you use for the import is as follows:

- Excel spreadsheet - The first row of cells corresponds to the parameter names. Each column under the first row represents the parameter values you wish to import.

Should we specify that the parameter names have underscores as formal parameters can't have spaces?

### Import the Data

To import historical case data, do the following:

## Procedure

1. Right-click the Package that contains your Process and select **New > Other**.
2. Expand **BPM** and select **Historical Case Data**.
3. Select the appropriate file type (**Excel** or **Text File**) and click **Next**.
4. Browse for the file and click **Load**, then click **Next**.

The simulation parameters are displayed as columns and each column displays the parameter values.

Select the parameters you want to import and click **Finish**. This creates a file with the extension **.realdata**.

Associate the Imported Data with the Start Event

5. Go to the **Properties** view of the **Start** event and click the Simulation tab.
6. Set the **Number of Cases**.



If you set the number of cases to more than are contained in your imported data, only the **Time** simulation parameter is used. If you set the number of cases to equal to or less than the number of cases in your imported data, both the **Time** and any other parameters are used.

7. Select **EMPIRICAL** as the **Distribution**.
8. Browse to select the **.realdata** file that was created from your imported simulation data.
9. Right-click the Process and select **Prepare Simulation**. This automatically generates the names for the simulation parameters and the values. These can be seen by highlighting the Process and in the Properties view clicking the Simulation tab.

You must rename the simulation Parameters so they match the imported data you want to use.



Any simulation parameter that does not correspond to a parameter in the imported data follows the default Sequence Flow from a Gateway.

Run the Simulation

10. Run the simulation as normal. Note that the **Start time** in the Simulation Control view corresponds to the first value of the **Time** simulation that you imported and that the distribution of other parameters is taken from the imported data. 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.
11. 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	<b>Case Number</b>	<b>Activity Name</b>	<b>Duration</b>	<b>Existing Customer?</b>	<b>Number of Drivers</b>
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.

- To import the spreadsheet containing your historical data, right-click the 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 Excel file. Press the **Tab** key (this activates the Next button). Click **Next**.
- 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**.
- The next dialog allows you to map any parameters not already used in the previous dialog onto Activities in the Process. Click **Next**.
- 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.
- Click **Finish**.
- 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:

Parameter	Value	Mean Time	Standard deviation
	Default	4.25	2.4367
U1_OR_HUJEdur_v4A...	No	7	0.8165
_U1_OR_HUJEdur_v4A...	Yes	2.6	1.3565

## 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.

### Procedure

1. To create the parameter, 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.
5. To add values to the parameters, highlight the Process and in the Properties view, click the Simulation tab.
6. Highlight the Parameter that you created, and click **Add Value...**
7. 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...**



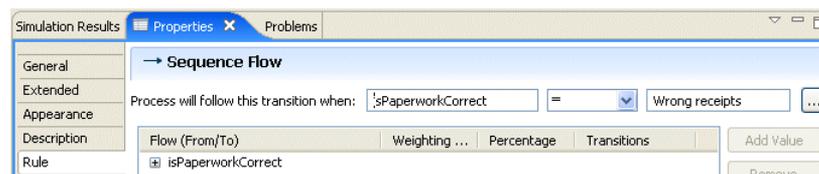
If you change an existing Parameter that is associated with a Gateway, you must also specify a new value for the conditional Sequence Flow (as described in the following task).

8. To associate the gateway with the parameter, open the Process and click the Rule Parameter tab.
9. 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.

10. To specify a value for the conditional sequence flow, highlight the Conditional Sequence Flow leaving the Gateway.
11. 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.

### Procedure

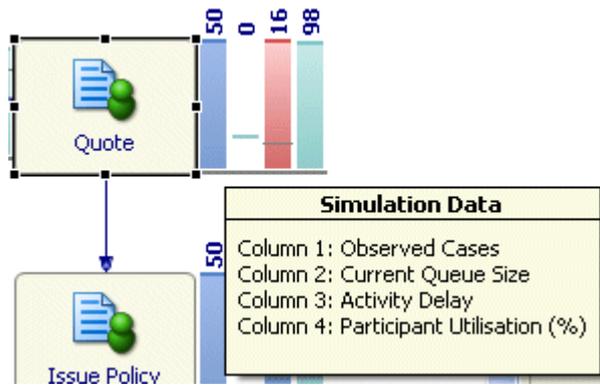
1. Open the Process.

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.

### Procedure

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](#).

## 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.

From the Simulation Results view, click  in the upper right of the view.

### Procedure

1. In the Simulation Report view, you can view the report.
2. 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](#) 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 these steps:

- [Obtaining a Data Source](#)
- [Creating a New Report](#)
- [Creating the Data Source](#)
- [Create the Data Set](#)
- [Creating the Report Parameters](#)
- [Creating a Table to Display the Data](#)
- [Importing the Report](#)

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

## Obtaining 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\3.7\studio-addins\eclipse\plugins\com.tibco.xpd.simulation.compare\_version.jar. Open it in WinZip and extract the file sample.sim.

## Creating a New Report

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

### Procedure

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.

## Creating 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.

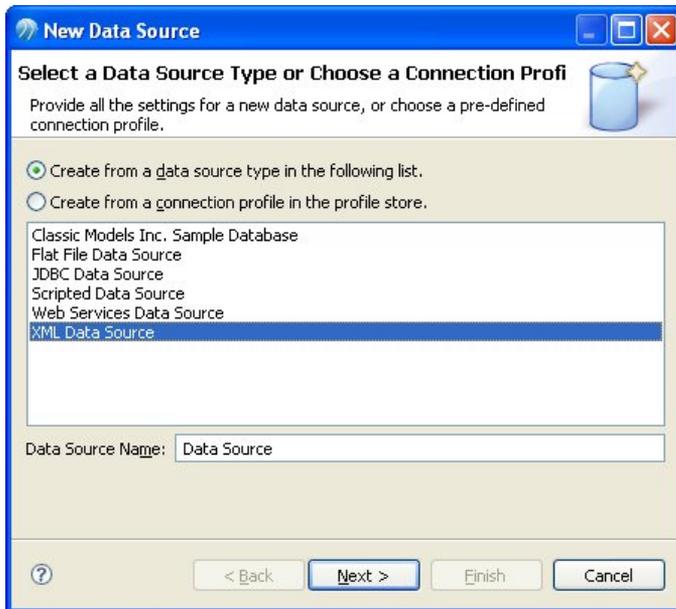


Before creating a data source or multiple sources for your first reports, consider the issues of project and resource organization. If you plan to reuse a data source in multiple report projects, you can create that data source in a library and reuse that data source from the library. The advantage of 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.

### Procedure

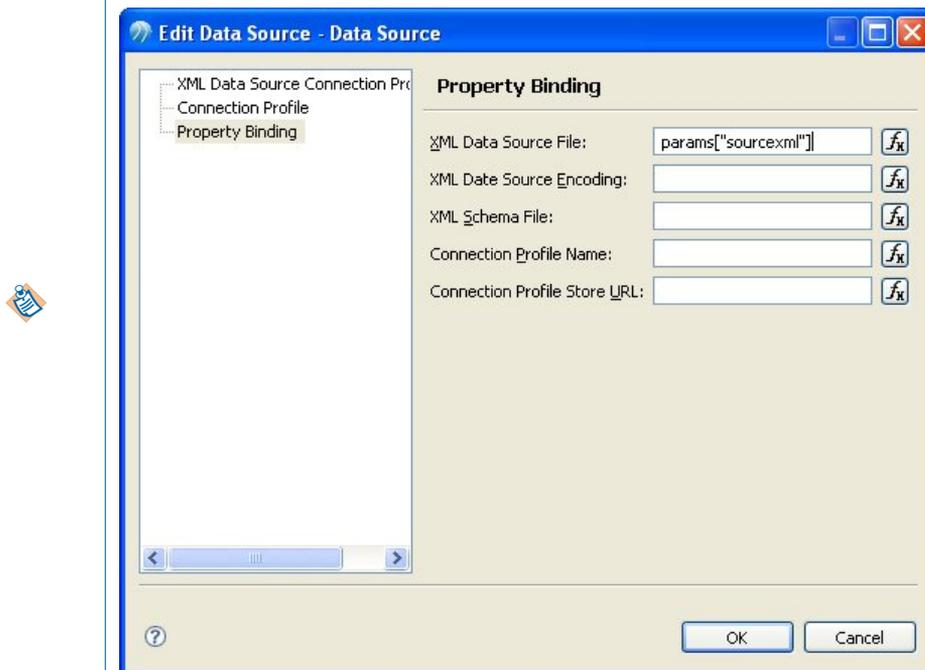
1. In the Data Explorer view, right-click **Data Sources** and select **New Data Source**.
2. Select **XML Data Source**, enter a name for the data source, and click **Next**.



3. Select the sample data source file (obtained in [Obtaining a Data Source](#)):
  - 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 [Obtaining a Data Source](#)), 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.

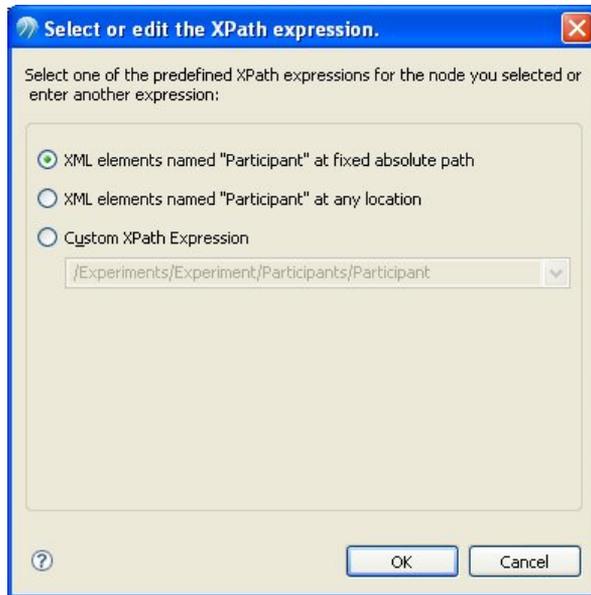


## Create the Data Set

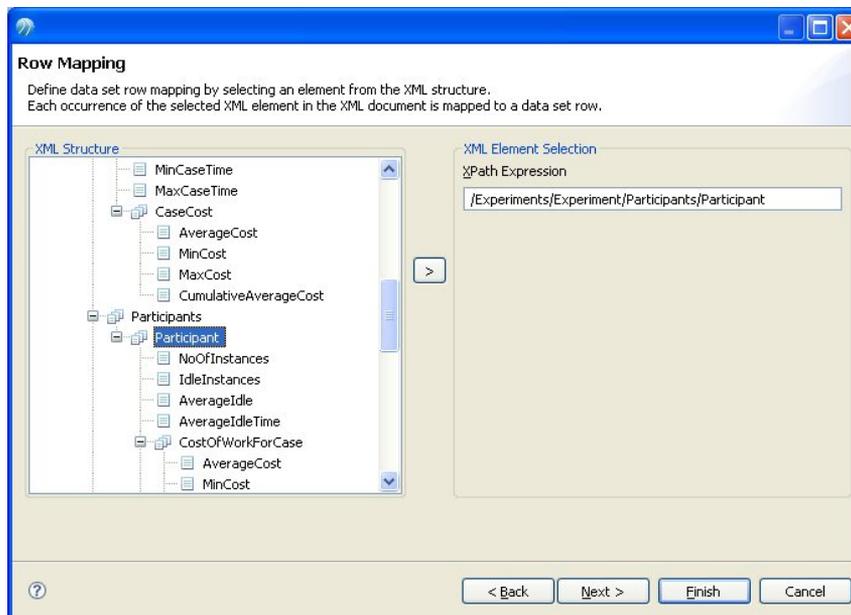
A data set identifies the data to retrieve from the data source.

### Procedure

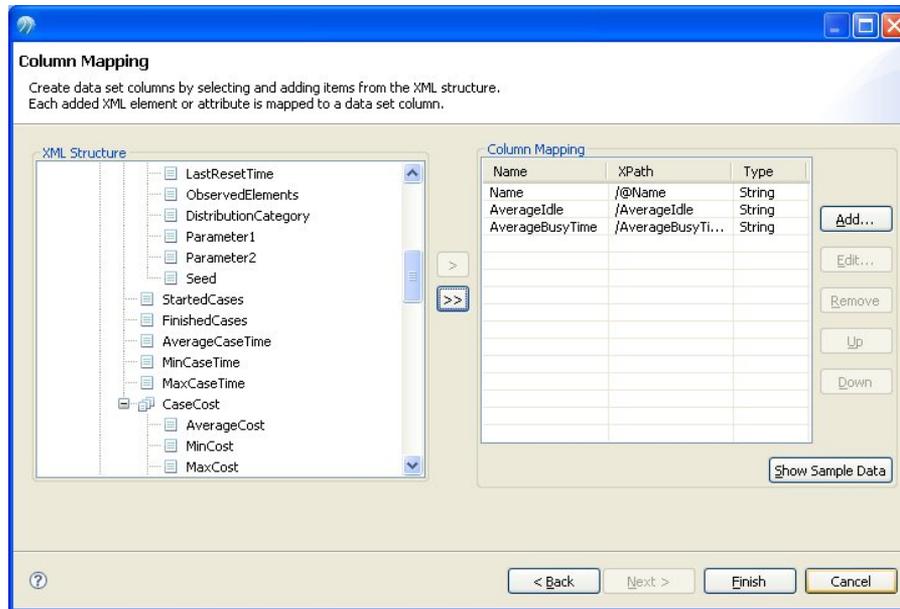
1. In the Data Explorer view, right-click **Data Sets** and select **New Data Set**.
2. Enter a name for the data set and click **Next**.
3. In the Sample XML Settings dialog, click **Next** to accept the default settings.
4. On the Row Mapping dialog, select **Participant**, and click the central arrow button to set the XPath expression. Accept the default XPath expression in the resulting dialog and click **OK**:



5. The Row Mapping dialog should look like this:



6. Click **Next**.
7. In the Column Mapping dialog, select the participant **Name**, **AverageIdle**, and **AverageBusy**, accepting the default column mapping for each. The dialog should look like this:



8. Click **Finish**.

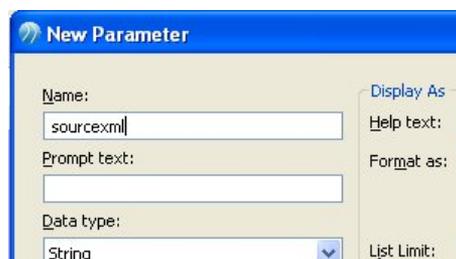
The Edit Data Set dialog is displayed, allowing you to further define the data set. Click **OK** to accept the default values.

## Creating the Report Parameters

Create a parameter to point to the sample XML data source file for the report.

### Procedure

1. In the Data Explorer view, right-click **Report Parameters** and select **New Parameter**.
2. Give the parameter the name **sourcexml** then click **OK**.

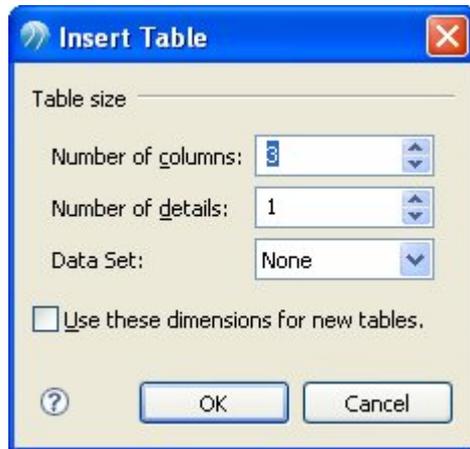


## Creating a Table to Display the Data

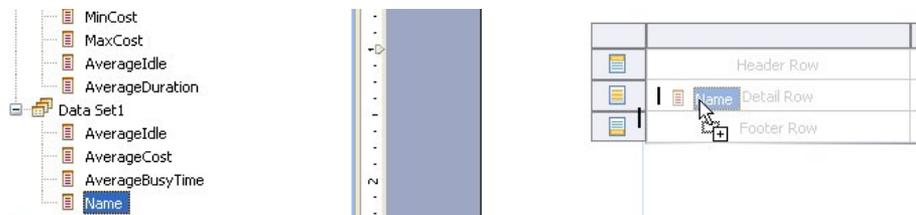
In this task, create a table to display the data from the data set that you created previously. You start by inserting a table element, then you insert data elements in the table.

### Procedure

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:



- Return to the Data Explorer (select **Window > Show View > Data Explorer** ).
- Drag the Name from the Data Explorer to the detail row of the first column of the table:



- 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		

## Importing the Report

### Procedure

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



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

- Give the report a name, use the **Browse Workspace** button to locate the report file, and click **OK**.
- The newly-created report now appears in the Compare Simulation Results view.
- 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		

- 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.

### Procedure

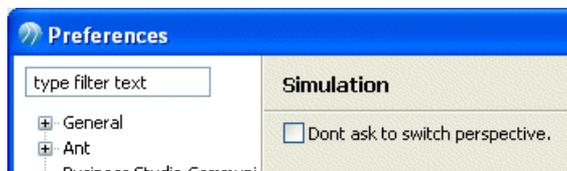
1. Edit the report in the Report Design view.
2. Save the report.
3. Click the **Display Report** button in the Compare Simulation Results view to see the effect of your changes on a report generated from real data.

## 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**.

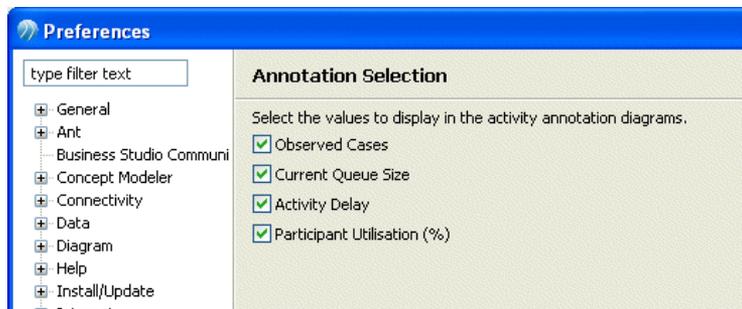
### Procedure

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



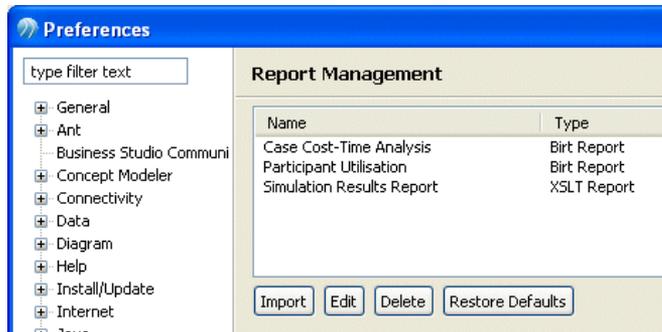
This allows you to control whether you are prompted to confirm changing the perspective when you run simulation. If desired, change the setting and click **Apply**.

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



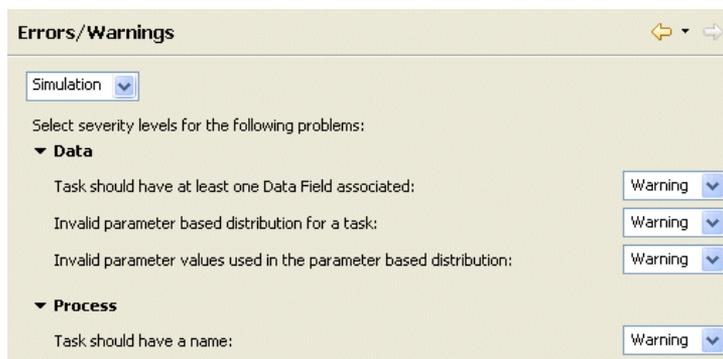
This allows you to customize the annotations that are displayed when the Process is being simulated. For an explanation of these annotations see [View the Simulation Progress](#). If desired, change the settings and click **Apply**.

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

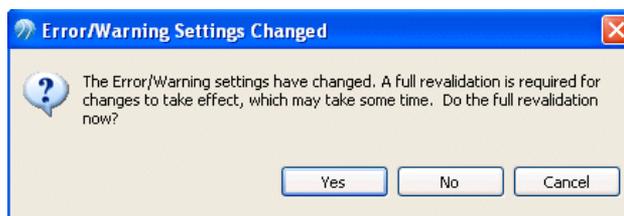


This dialog allows you to edit, delete or import reports to be used with simulation. For more information see [Designing Custom Reports](#).

- 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.
- 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.

## 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 section describes the views contained in the **Simulation Perspective**.

### 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.

Property	Meaning
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).

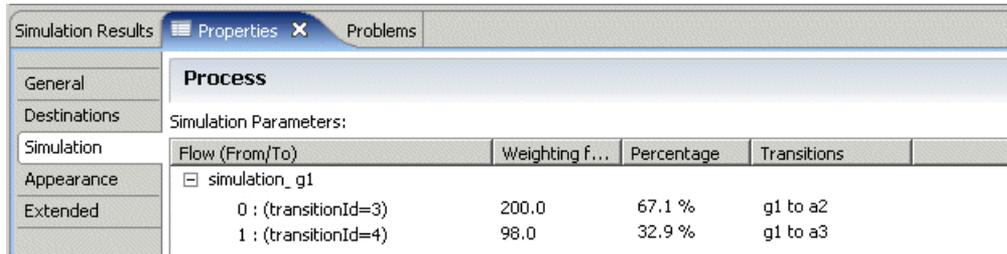
## Simulation Report View

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](#)).

## 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
simulation_g1			
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.

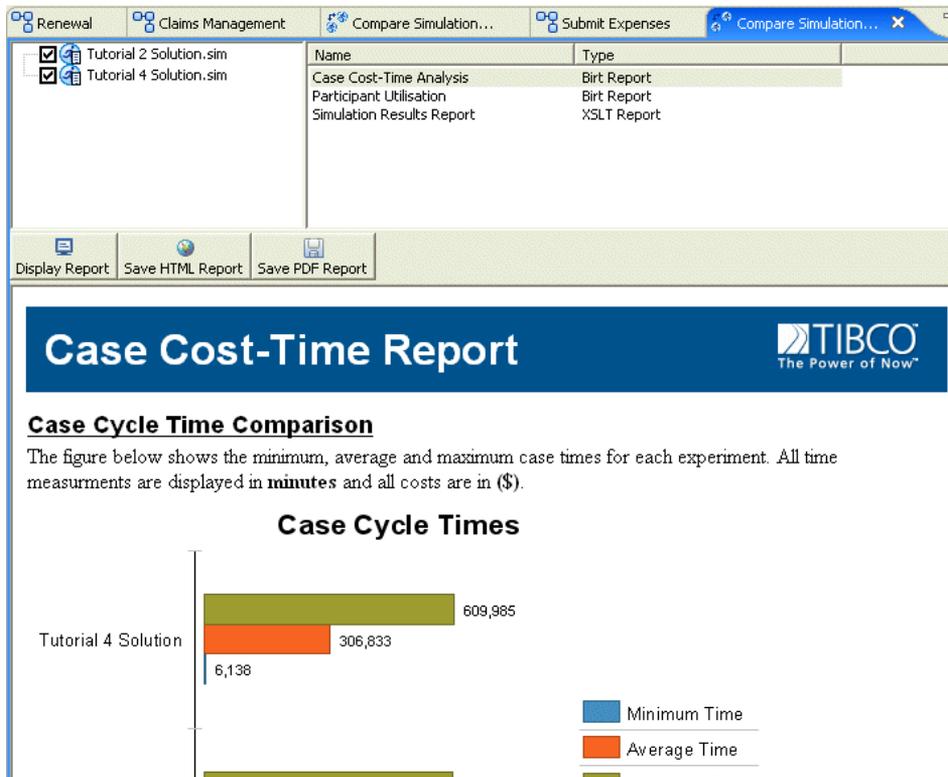
The simulation parameters in the Simulation Properties view do not necessarily correspond exactly to the Process itself. For example, if you delete a Gateway or a Sequence Flow from your Process, the simulation parameters for these objects are retained in the Simulation Properties view. This is because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

See [Assign Activity Duration](#).

See [Assign Unit Costs to Participants](#).

See [Set the Number of Simulation Cases](#).