

BNet®.News:
Tips for BNet.Builder™

Introduction

In this guide, you'll find a compilation of [BNet.Builder](#) tips from BNet.News, the Bayesian Belief Newsletter published by [Charles River Analytics, Inc.](#)

For [BNet.EngineKit™](#) tips, [click here](#).

BNet.Builder User Tip

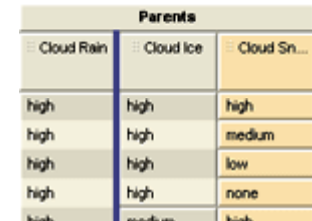
Rapid CPT Data Entry

BNet.Builder offers a number of ways to speed up entering data into probability tables.

One example is entering the same values into multiple rows in a CPT. The value for each cell could be entered one at a time, but if the table is large, then filling in each cell by hand becomes time consuming. One way to speed things up is to group cells that need the same values together and set all of the values at once, as follows:

1. Click and drag column headers for the parent nodes until all rows that need to have similar values are together.
2. Highlight the rows which need to have the same values by clicking the row headers. Press and hold the control key and click on other rows if you need to add more.
3. Set the values all at once using the value sliders or by entering the numbers in the fields above the value sliders.

Note: You can also copy and paste values from one row to another, or from Excel or other spreadsheets.



The screenshot shows a table titled "Parents" with three columns: "Cloud Rain", "Cloud Ice", and "Cloud Sn...". The first column is highlighted in blue. The rows are: "high", "high", "high", "high", and "high". The values in the "Cloud Ice" and "Cloud Sn..." columns are "high", "medium", "low", and "none" respectively for the first four rows. The fifth row is partially visible and shows "high" in the "Cloud Ice" column.

	Cloud Rain	Cloud Ice	Cloud Sn...
	high	high	high
	high	high	medium
	high	high	low
	high	high	none
	high	high	

BNet.Builder User Tip

Easy Network Layout

Two buttons in BNet.Builder can help you create clean, attractive, organized networks:

Magnetic grid and Hierarchical layout.

Magnetic grid: To quickly and easily lines up nodes, click the Magnetic grid button. When Magnetic grid is on, nodes snap to the grid when you create or move them.

Hierarchical layout: To adjust the layout of the entire network, click the Hierarchical layout button. This feature aligns child nodes beneath their parent nodes.

You can select Undo from the Edit menu (or use the Control + Z keyboard shortcut) to return to the previous layout.

BNet.Builder User Tip

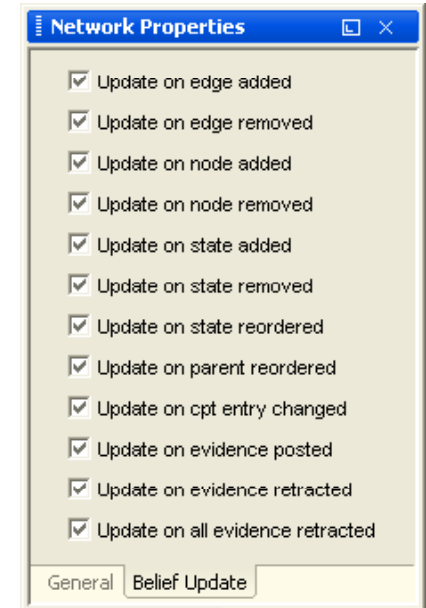
Belief Update Settings

BNet.Builder features advanced belief updating technology, which means you never have to "compile" your network or switch back-and-forth between edit and query modes. Beliefs are updated automatically after any modification you make to your network.

In some cases (for example when working with large networks) you may not want beliefs to be updated automatically for performance reasons. BNet.Builder gives you total control over when belief updating occurs.

To select belief update settings:

1. Open the Network Properties by:
 - Selecting the Window->Network Properties menu item
 - Right-clicking in the main network view and selecting Network Properties
 - Using the Ctrl+5 keyboard shortcut
2. Select the Belief Update tab
3. Place a checkmark next to the modifications after which you'd like beliefs to be automatically updated.
Beliefs will only be updated automatically after the modifications that are checked. To manually update beliefs, either click the Update beliefs toolbar button or select the Tools->Update beliefs menu item.



BNet.Builder User Tip

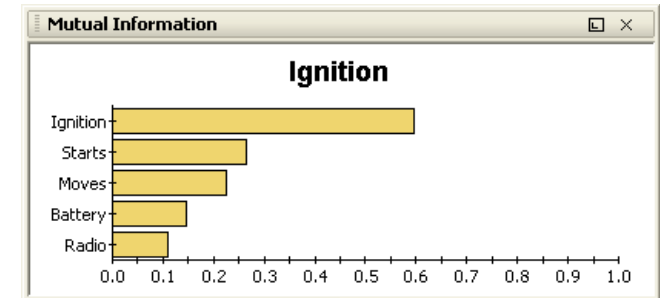
Mutual Information

BNet.Builder provides easy access to a form of sensitivity analysis called mutual information. The mutual information for a node (called the query node) in a Bayesian network is a value for every other node in the Bayesian network that represents how new evidence for the node would increase certainty in the beliefs of the query node. Using mutual information, you can determine the node you should obtain evidence for to increase certainty the most in the beliefs of the query node. The higher the mutual information value, the more that the evidence for that node will increase certainty in the beliefs of the query node.

To display mutual information, first open the Mutual Information window using one of the following procedures:

- Right-click on a node and select Mutual Information
- Use the Ctrl+2 shortcut
- Select Mutual Information from the Window menu

When the Mutual Information window is open, you can select any node in the network to view its mutual information values.



BNet.Builder User Tip

Working with States

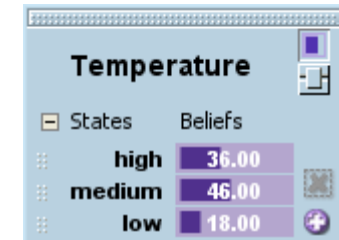
BNet.Builder makes it easy to work with the states of a node. Both the expanded node and the Node Properties window contain tools for adding, renaming, reordering, and removing states.

To add a new state to a node simply click the "Add a new state" button, which looks like a plus sign. A new state will then be added to the node.

To rename a state click on the state name to begin editing it. When you're finished, either press the Enter key or click a different area of the screen to rename the state.

To reorder a state, drag the grip icon (just to the left of the state name) up or down. As you drag, you'll see a horizontal line where the state will be placed. Drop the state in the new position to reorder it.

To remove a state, first select it by clicking it, and then click the "Remove the selected state button" which looks like the letter X. Note that you cannot remove a state from a node that has only two states, because every node must have at least two states.



BNet.Builder User Tip

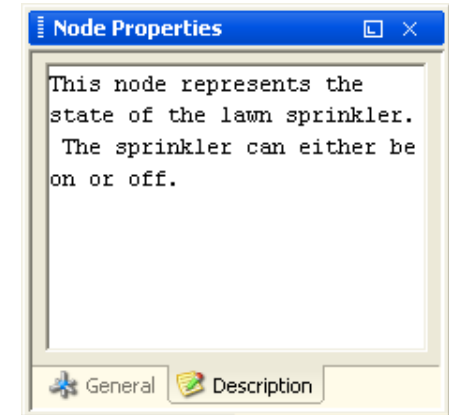
Node Description

The Node Properties window in BNet.Builder allows you to provide a textual description for a node. The node description can include an unlimited length of text for you to provide information to describe your node.

To view or edit a node's description:

1. Open the Node Properties window. You can do this in one of three ways:
 - Select the Node Properties item from the Window menu.
 - Right-click a node and select the Node Properties item.
 - Use the Ctrl+3 keyboard shortcut.
2. When the Node Properties window opens, click the Description tab at the bottom of the window.
3. Type the text in the white box in the Description tab.

The node description will be saved to the file so you'll be able to reuse it at another time.



BNet.Builder User Tip

Grid and Declutter

The magnetic grid can be used to help you position nodes in your Bayesian networks. When enabled, you'll see a faint grid of dots in the background and the upper-left corner of each node will snap to a dot when being repositioning. To enable the magnetic grid, either select the Magnetic Grid toolbar toggle button (a grid of dots with an arrow) or select the View/Magnetic grid menu item.

Another tool to assist you in positioning the nodes in your Bayesian networks is the Declutter Layout. You may often end up with nodes that overlap each other, especially when you expand beliefs or evidence on a node. The Declutter Layout slightly repositions overlapping nodes so they no longer overlap.

To switch to the Declutter Layout, click the Declutter toolbar button.

BNet.Builder User Tip

Multiple Networks

When you open multiple Bayesian network files, each network is placed in its own tab in the main part of the application window. By default you can only view a single network at a time. However, if you drag one of the tabs to the right or bottom side of the window, you can view multiple networks at the same time. You can also right-click on a tab for more options.

BNet.Builder User Tip

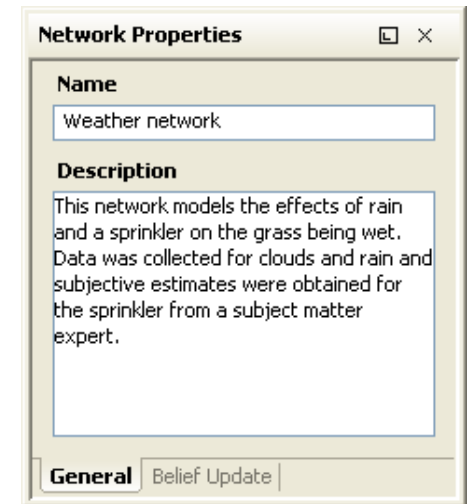
Network Name and Description

The Network Properties window in BNet.Builder allows you to provide a textual name and description for a Bayesian network. The network name is usually a short string that briefly describes the network or is meaningful in some way. The network description can include an unlimited length of text for you to provide information to describe your network.

To view or edit a network's name and description:

1. Open the Network Properties window. You can do this in one of three ways:
 - Select the Network Properties item from the Window menu.
 - Right-click in the background and select the Network Properties item.
 - Use the Ctrl+5 keyboard shortcut.
2. When the Network Properties window opens, click the General tab at the bottom of the window
3. Type the text into the Name or Description text areas.

The network name and description will be saved to the file so you'll be able to reuse it at another time.



BNet.Builder User Tip

Export to .png Image File

In the BNet.Builder 1.3 release you can save your Bayesian network to an image file, which can then be used in publications, documents, and web pages.

To save your Bayesian network to an image file:

- * From the Tools menu, select "Export to PNG..."
- * Select the option to save as a .png file.

Not only can you export the Bayesian network to a .png file, you can also export the Conditional Probability Table, Belief and Evidence Summary, and Mutual Information views to a .png file as well.

To export the Conditional Probability Table, Belief and Evidence Summary, or Mutual Information views:

- * Open the view
- * Click on the title bar to select it
- * From the Tools menu, select "Export to PNG..."

BNet.Builder User Tip

Expand/Collapse Beliefs and Evidence

Each node displayed in BNet.Builder has buttons to expand or collapse both beliefs and evidence. However, if you want to expand or collapse the beliefs or evidence on many nodes at once, clicking the button on each node can become very tedious. BNet.Builder 1.3 solved this problem by introducing four new commands that expand or collapse the beliefs or evidence on all selected nodes.

To use these new commands, select multiple nodes and choose Show beliefs, Show evidence, Hide beliefs, or Hide Evidence in the View menu. Each of these commands also has a toolbar button (look for the same icons used in the View menu).

BNet.Builder User Tip

Documentation

BNet.Builder includes three useful documents to help you. You can access them in the Help menu.

Quick Start Guide - covers the basics of editing & using Bayesian networks.

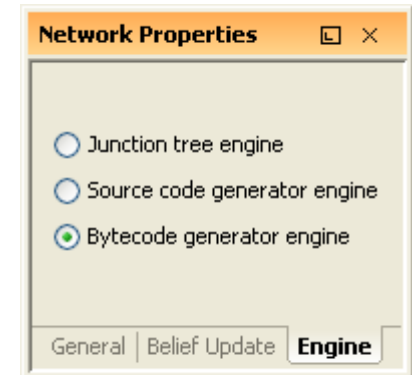
User's Guide - explains in detail of all of BNet.Builder's features.

Overview of Bayesian Belief Networks - provides a background on the theory & math of Bayesian networks.

BNet.Builder User Tip

Inference Engine

BNet.Builder 1.4 introduced an easy way for you to switch between several inference engines. Open the Network Properties window and select the Engine tab. The selected inference engine will be used in all open Bayesian networks.



The Bytecode generator engine is the preferred inference engine for everyday use. It updates beliefs the fastest, but can run into memory problems on large BNs. If you do run into memory problems with large BNs, try the Junction tree engine -- it is good for very large networks, but can be slower at updating beliefs.

BNet.Builder User Tip

Undo/Redo

Undo and redo are common operations supported by modern applications that let you easily restore the application to a previous state when you have unwanted changes.

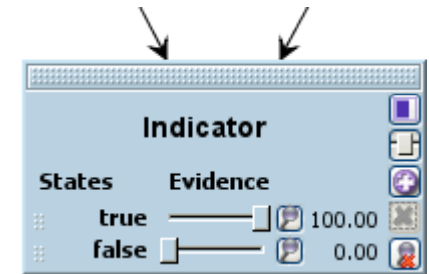
BNet.Builder supports undo and redo for all actions that modify the Bayesian network, allowing you to undo any change you made to your model. You can find undo and redo in the Edit menu and on the main application toolbar.

BNet.Builder User Tip

Fix Original Image: Evidence

BNet.Builder provides easy ways to work with evidence directly on the nodes in the network. Once you expand the evidence user interface on a node (by clicking the "Show evidence" button), you can click the Hard Evidence button for a particular state. This sets its evidence to 100% and sets evidence for all other states to 0%. You can also drag the Soft Evidence sliders to represent uncertainty in the evidence, as well as type numerical evidence into the text fields.

To remove evidence from a node, click its Retract Evidence button, found in the bottom-right corner of the node. To remove all evidence from a network, click the Retract All Evidence button on the toolbar.



BNet.Builder User Tip

Cut / Copy / Paste

BNet.Builder supports cut, copy, and paste operations on an individual node and a group of nodes. Simply select the node(s) you want to cut or copy, click the Cut or Copy toolbar buttons (or use the Ctrl+X or Ctrl+C keyboard shortcuts), and then click the Paste toolbar button to paste (or use the Ctrl+V keyboard shortcut).

If you cut or copy a single node, pasting will create a copy of that node and its CPT, as well as any edges directed into it. If you cut or copy a group of nodes, pasting will create copies of all those nodes and their CPTs, as well as any edges between them.

BNet.Builder User Tip

Upgrading to the Commercial Version

The Evaluation version of BNet.Builder limits networks to five nodes each and displays a Charles River Analytics logo in the background. The Commercial version removes the five node limit and does not display the logo.

You can purchase a license for BNet.Builder directly on our Web site at <http://www.cra.com/bnet.builder>. All you need to provide is your Activation Key, which can be found by going to Help > About BNet.Builder.

Once you purchase a license, we will send you a license file called BNet.key. Then follow these steps:

- Click the Upgrade button in the About dialog box
- Select "I have a valid license file" and click Next
- Specify the location of the BNet.key license file and click Finish

The five node limit and the Charles River Analytics logo will then be removed.

BNet.Builder User Tip

Network Zoom

Four buttons in BNet.Builder can help you manage network of varying sizes: Zoom In, Zoom Out, Fit to Window, and Actual Size.

Zoom In: To zoom in to a network, click the Zoom In button.

Zoom Out: To zoom out from a network, click the Zoom Out button. This feature allows you to see more of a network in the network view at once. Note that nodes may only be interacted with when at actual size.

Fit to Window: To set the zoom level such that all nodes in the network will fit into the current network view screen, click the Fit to Window button.

Actual Size: To set the zoom level back to the actual size, click the Actual Size button.


BNet.Builder User Tip

Randomized CPT Entry

Randomized values for all CPTs can be automatically generated by going to the Tools menu and choosing the “Randomize all CPTs” option.

BNet.Builder User Tip

Print

Your Bayesian network can be printed, either by selecting Print from the File Menu, using its  keyboard shortcut (Ctrl + P), or pressing the toolbar button ..

BNet.Builder User Tip

Normalized Data

If any node in your belief network contains non-normalized data, the BNet.Builder status bar displays an error message and a "Normalize" button. Click the button to normalize all the data in the belief network.

BNet.Builder User Tip

Renaming Nodes

If your belief network is showing expanded nodes, click the name of the node to edit it.

Press Enter or click outside the node and it will automatically expand to display the new name.

You can also rename a node in the Belief and Evidence Summary window or in the Conditional Probability Table.

BNet.Builder User Tip

Changing Update Settings for Slower Machines

If you build a very large belief network with many nodes and/or many states, or if you are working on a slower machine, it is recommend that you change the update settings for the belief network so BNet.Builder will not automatically update the entire belief network after each change. To change the settings for events that trigger an update, click the Belief Update tab in the Network Properties window.

BNet.Builder User Tip

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BNet.News

BNet.News is a free newsletter to keep you up to date on BNet software and applications of belief networks. It is published approximately every other month.

BNet.News brings you:

- Tips and examples you can use in applying belief networks and BNet software
- Interesting applications of belief networks
- Upcoming BNet tutorials
- Product announcements
- Price and Sale announcements
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