

Welcome to MATRIX_x 7.0.

Major new features include:

- BetterState statechart component of SystemBuild™ with C and Ada code generation.
- Block diagram enhancements, including allowing pins to enter or exit from any side, flexible block name positioning, and expanded character set for labels.
- IfThenElse blocks with output ports (pins) and a prolog section.
- Configuration management interface to commercial file and version control systems.
- Optimized and restructured fixed-point functions achieving over 50% size reduction in some applications.
- Code generation template for VxWorks® 5.4.
- Xmath® graphics function `plot2d()` providing access to `plot()` and `uiplot()` features plus multiple windows and data viewing.
- Improvements to AutoCode®, DocumentIt™, and RealSim™.

SystemBuild with BetterState

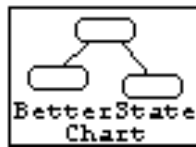
SystemBuild 7.0 integrates BetterState seamlessly as an optional module so that BetterState charts can be used within SystemBuild models. The BetterState Editor appears as one of the

SystemBuild editors (similar to the SuperBlock Editor). You can now simulate your model with Sim, ISIM, and RealSim and generate code with AutoCode capabilities for BetterState charts. Statechart models can be used to generate C or Ada code, and interactive simulation enables the animation of BetterState diagrams.

BetterState, within SystemBuild,

has the following new features:

- Data Dictionary
- Use of BlockScript
- Enhanced Catalog Browser
- A new BetterStateChart Block



BetterState

- Improved block face and interfaces
- Configuration management
- Extended character set for labels
- Ada code generator

A new Data Dictionary window

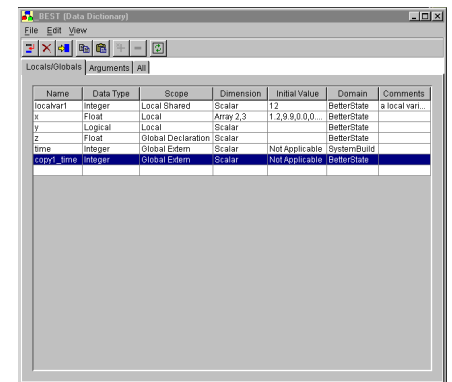
is accessible from the Statechart window.

The Data Dictionary is used to declare and view BetterState variables, to

display SystemBuild interface arguments (pin numbers and data types), and also to define local or global variables for the BetterState domain.

Each Data Dictionary window has a one-to-one correspondence to a statechart. You can view multiple data dictionaries at once.

If you are using BetterState charts that were created in BetterState 5.2 or before, Wind River encourages you to enter any variables declared in variable boxes in the Data Dictionary.



Name	Data Type	Scope	Dimension	Initial Value	Domain	Comments
localvar1	Integer	Local Shared	Scalar	12	BetterState	a local vari...
x	Float	Local	Array 2,3	1,2,9,9,0,0,0	BetterState	
y	Logical	Local	Scalar		BetterState	
z	Float	Global Declaration	Scalar		BetterState	
time	Integer	Global Edem	Scalar	Not Applicable	SystemBuild	
conv_time	Integer	Global Edem	Scalar	Not Applicable	BetterState	

For more information about the Data Dictionary, see the *BetterState User's Guide*.

BlockScript, which provides a

generalized programming capability for defining SystemBuild blocks for simulation and code generation, can now be accessed from BetterState.

To define BetterState actions, you can specify them in BlockScript language or reference a procedural SuperBlock.

Procedural SuperBlocks can be used in state on-entry actions, state during actions, state on-exit actions, and transition actions.

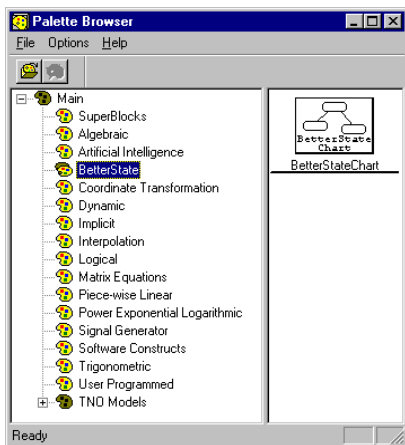
BlockScript provides the following new features:

- Provides language-independent syntax (generates C or Ada code from the model without modification).
- Is the SystemBuild BlockScript syntax for specifying conditions and actions.
- Supports SystemBuild data types: float, integer, and logical.

For more information about BlockScript, see the new *BlockScript User's Guide*.

BetterState now supports Ada

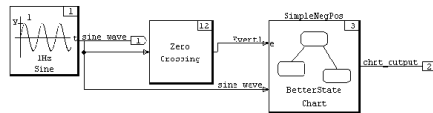
code generation. When you complete your design, you can generate code for charts automatically to implement the design in Ada or C. With the BetterStateChart Block, event-driven and time-based subsystems can be modeled in SystemBuild. The BetterStateChart Block is located on the BetterState palette of the SystemBuild Palette Browser and can be dragged and dropped into a SystemBuild diagram like any other SystemBuild block. Blocks can be multiple-instanced.



Each SystemBuild use of a BetterState Block is a different instance of the

statechart. The BetterStateChart Block can be asynchronously triggered from within a continuous subsystem or run periodically in a discrete subsystem.

- **Continuous** – In a continuous subsystem, the procedural chart section of the BetterStateChart Block is not called. The block has one input per event that exists in BetterState in addition to the user-defined inputs and outputs. The event input pins are made by connection to zero-crossing monitor signals and the BetterState chart is only called if one of the monitors is triggered. The correct event procedure that corresponds to the signal is called within BetterState.
- **Discrete** – In a discrete subsystem, the BetterState chart is called at the rate of the parent subsystem and only the procedural portion of the block is used.



BetterStateChart Block has these characteristics:

- Enables you to provide multiple instances of a chart.
- Provides function call interface for BetterState charts.

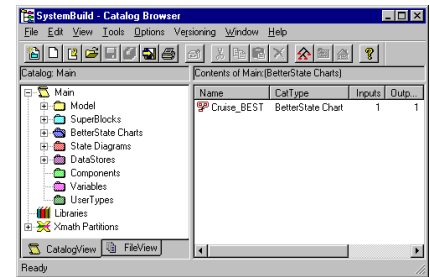
SystemBuild

SystemBuild changes include Catalog Browser enhancements, interface improvements, configuration management, extended character set, IfThenElse block additions, signal splitting, and engine and tire models.

Catalog Browser has an

enhanced Catalog pane, on the left side of the SystemBuild Catalog Browser, which has several new sec-

tions under Main (Model, BetterState Charts, Variables, and User Types) and now lists Xmath Partitions.



The SuperBlocks folder previously displayed the model hierarchy. With the integration of BetterState, SystemBuild now supports three hierarchical elements: SuperBlocks, BetterState Charts, and BetterState pages. The Model folder shows all three types, and the SuperBlock, BetterState, and State Diagrams folders each display a non-hierarchical list of elements.

The BetterState Charts folder acts similar to the SuperBlocks folder. If you select this folder, the Contents pane shows a list of all BetterState charts in this scope of the catalog. If you expand this folder, the next level is the list of statecharts contained at this scope of the catalog. When you select a chart, the Contents pane shows all of the states on the root page of that chart, as well as any subpages to that root page. This folder is not expandable even if it has subpages.

The Variables folder acts similar to the DataStores folder. When selected, the Contents pane displays all of the global variables defined at this scope of the catalog. Global variables are either SystemBuild global variables (referenced in variable blocks) or BetterState global variables (defined in the Data Dictionary).

SystemBuild also imports and exports BetterState charts through the Catalog pane, displays user-defined datatypes, and now displays Xmath Partitions from the Catalog view.

SystemBuild has interfaces that

allow pins to enter or exit from any side (top, left, right, or bottom) for input or output pins. You can define a

block input face and a block output face independently.

You can rotate block names by

using the **rotation** keyword (block and block name rotation are independent). You can use the new **direction** keyword to toggle the definitions of the block input and output faces.

Block Diagram Enhancements

SystemBuild 7.0 includes 4-way input/output face entry/exit. You can select a Left (existing), Right, Top, or Bottom entry or exit for a block from the Inputs or the Display tab.

Configuration management (CM)

feature of SystemBuild enhances the ability to manage data files in ClearCase™ 3.2.1, Merant PVCSTM 6.6, and Microsoft Visual SourceSafe™ 6.0 (for Windows only). CM, accessed from the Versioning menu and the FileView tab of the Catalog Browser, has the following features:

- Provides a seamless interface to basic CM operations from within SystemBuild.
- Defines a home file for each catalog item.
- Provides a file view for viewing currently loaded files.
- Tracks status on new, modified, moved, overwritten, and deleted items.

For detailed information about the above and other CM features, see the *SystemBuild User's Guide*.

SystemBuild supports extended

character set for block output labels and SuperBlock external input labels. This extended character set includes the `!"#$%&'*+,-./<=>?@^` characters and the rest of the standard ASCII 128 character set, except it excludes all control characters (ASCII 1–32) and `0{}[];'\|~&`.

The IfThenElse block has been

improved with output ports (pins) and a prolog section.

The IfThenElse block output ports are available from the face of the first condition block in the IfThenElse block chain. You can connect to these ports as if they were the output ports of any other standard block. Output from each of the block sections is connectable to the output ports the same way as the output of the content of a SuperBlock is connected to its external output. With this capability, you no longer need to use variable blocks and the Sequencer with the IfThenElse block.

You can define default values for each output channel in the prolog section. SystemBuild executes the prolog section before any other IfThenElse sections. This guarantees that all of the output has been defined.

If any of the output of the IfThenElse block is not connected in each section of the block structure, some output may not be assigned if that output is not defined in the branch of the block that is being executed. This can cause some of the output to be undefined unless you use the prolog section.

This section appears as the uppermost section in the block and is defined by typing "prolog" in the Code tab of the IfThenElse Block Properties dialog.

Signal splitting is now marked in

a diagram. Signal splitting occurs when one output is connected to the input of multiple blocks. The markers are placed automatically on the SystemBuild diagram whenever two or more connection lines (that share the same path from the same source) branch off.

The TNO Models section of the

Palette Browser provides a selection of TNO Automotive blocks, including dynamo and tire subsections. The dynamo subsection includes blocks for

diesel engines, combustion, turbochargers, manifolds, and fuel control. The tire subsection includes blocks for creating models with tire specifications. For additional information, see the *Dynamo User's Guide*.

AutoCode and DocumentIt

AutoCode 7.0 provides the following new features:

- Fixed-point libraries have improved source code layering, reduced fixed-point object and image sizes, and automatic standalone utility compilation
- Variable step-size solver
- Code Generation template support for VxWorks
- Name mangling report
- **makefile** generation and the **acmake** command
- AutoCode SDK interface now part of the AutoCode product

DocumentIt support for the BetterState code generator is limited to extracting comments from the BetterStateChart block dialog. Documentation data cannot be extracted from within a BetterState chart.

Xmath

Xmath 7.0 introduces **plot2d()**, a graphics function that provides a shortcut to PGUI **uiPlot()** features for users familiar with the plot function. **plot2d()** accepts the parameters and keywords of both **plot()** and **uiPlot()**. By converting **plot()** function calls to **plot2d()**, you can employ all **uiPlot()** functionality, including:

- Multiple Plot Windows — You can create plots on multiple windows from the Xmath Commands window and address plot commands to any given existing plot window.

- **Enhanced Command Capability** — You can specify and update all plot attributes with keywords issued from the Xmath Commands window.
- **Interactive Data Viewing**— With the mouse, you can interactively display the x and y values of points along any plot line.
- **Multiple Y Axes** — You can display multiple Y axis scales on a plot.
- **Improved Default Background and Line Colors** — New default background and line colors improve the visual presentation of plots.
- **Improved Plot Attributes** — Grid line and tick mark spacings, as well as text font sizes, are determined relative to the size of the plot.
- **Plot Legend Placement** — You control placement of plot legends with **plot2d()** command options.

For more information about Xmath graphics, see the *Xmath User's Guide* and the **plot2d()** discussion in MATRIX_X Help.



RealSim

RealSim 7.0 includes the following new features:

- Supports AutoCode for BetterState charts, although back animation is not supported.
- Improvements to data acquisition.
- Automation of UserCode Block use.
- IP-16DAC, IP-230DAC, and IP-235DAC board support for AC-1000, AC-104, and RealSim PCI-Pro controllers.
- VMIVME 4150 board support for the AC-1000 controller.

- Datel PC-420 arbitrary wave form generation board support for RealSim PCI-Pro systems.
- Flex/104A board provides fully-ruggedized extended temperature support for AC-104.

Documentation and Support

The MATRIX_X documentation CD provides a structured set of online books in portable document format (PDF). To view PDF documents, you must have Acrobat Reader 3.0 or later (with the search feature). The MATRIX_X 7.0 documentation CD includes a copy of Acrobat Reader with Search 3.01. You can download the reader from www.adobe.com or copy it from the CD to the Xmath installation directory (the recommended location). Acrobat 3.01 provides full text search capability. The CD also has a master index to assist you in locating topics.

The documentation CD covers all MATRIX_X products including Xmath, SystemBuild, BetterState, AutoCode, DocumentIt, and RealSim. It also includes licensing documentation from GLOBEtrotter[®] Software, animation documentation from Altia, the Diab C/C++ compiler documentation, and the pSOSystem[™] PowerPC manual set. The Diab C/C++ compiler and PowerPC documents are supplied primarily for use with the RealSim AC-1000 controller.

Hardcopy Documentation

PDF files can be printed on any PostScript printer. For more information on Adobe PDF format or related products, see Adobe's website at www.adobe.com. Also, MATRIX_X Help can be printed from Netscape.

MATRIX_X provides a hypertext

markup language (HTML) Help system. MATRIX_X Help is a self-contained system with multiple hypertext

links from one topic to another. To start MATRIX_X Help and get instructions on viewing, navigating, and printing topics, type **help matrixx** from the Xmath Commands window.

MATRIX_X runs on most UNIX and

Windows platforms as follows:

- The software supports Windows NT[®] 4.0, Windows[®] 2000, Windows ME, Windows 98, Windows 95, and Solaris[®] 2.7.
- The release 7.0 product CD includes RealSim, Altia[®] Design 4.5, and Altia FacePlate 4.5.
- The MATRIX_X 7.0 documentation CD includes online books in portable document format (PDF) and Adobe[®] Acrobat[®] Reader with Search 3.01.
- The MATRIX_X Help system requires Netscape Navigator[™] 3.0 or later. MATRIX_X 7.0 includes the most recent version of Netscape Navigator available at release time.

Technical support information is

available on the web at the following site:

www.windriver.com/support

From this site select MATRIX_X.

The email address for support is **mx_support@windriver.com**. An ASCII template is available in: **MATRIX_X/version/support.txt**

For additional contact information, please visit:

www.windriver.com

