



GTKWave 3.0 Wave Analyzer User's Guide

User's Guide
GTKWave

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This manual supports GTKWave 3.0 and higher versions.

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Using This Manual

Printing Conventions

Text printed in the font `courier` reflects messages that will be seen on screen at a command prompt or as program output.

Text printed in **`courier bold`** is to be entered by the user.

Text printed in smaller monospace is help available either as a manual page or as a program help option.

Text printed in *italics* is a pathname in the file system or is the name of an application program.

Compiling and Installing GTKWave

Unix and Linux Operating Systems

Compiling GTKWave on Unix or Linux operating systems should be a relatively straightforward process as GTKWave was developed under both Linux and AIX. External software packages required are any version of GTK (<http://www.gtk.org>) greater than or equal to 1.2, and *gperf* (for RTLBrowse) which can be downloaded from the GNU website (<http://www.gnu.org>). The compression libraries *libz* (zlib) and *libbz2* (bzip2) are not required to be installed on a target system as their source code is already included in the GTKWave tarball. Likewise goes for PCCTS-1.33 source code (required for compiling *vertex*) which is included in the *contrib/* directory. Note that PCCTS-2.0 will not work as the grammar file format for v2.0 is incompatible with v1.33.

Compiling and Installing

Un-tar the source code into any temporary directory then change directory into it. After doing this, invoke the configure script. Note that if you wish to change the install point, use the doubledash `-prefix` option to point to the absolute pathname. For example, to install in `/usr`, type `./configure -prefix=/usr`.

```
1 :/tmp/gtkwave-3.0.0> ./configure
Build GTKWave for GTK+-1.x or 2.x? Please enter '1' or '2'
```

Enter '1' or '2' depending on which version of GTKWave you would like to compile against. Typically, you will enter '2' (or just press enter).

```
2 :/tmp/gtkwave-3.0.0> make
```

Wait for the compile to finish. This will take some amount of time. Then log on as the superuser.

```
3 :/tmp/gtkwave-3.0.0> su
```

```
Password:  
[root@localhost gtkwave-3.0.0]# make install
```

Wait for the install to finish. It should proceed relatively quickly. When finished, exit as superuser.

```
[root@localhost gtkwave-3.0.0]# exit  
exit
```

GTKWave is now installed on your Unix or Linux system. To use it, make sure that the *bin/* directory off the install point is in your path. For example, if the install point is */usr/local*, ensure that */usr/local/bin* is in your path. How to do this will vary from shell to shell.

Microsoft Windows Operating Systems

Cygwin

The best way to run GTKWave under Windows is to compile it as an application to run under Cygwin. This will provide the same functionality as compared to the Unix/Linux version and better graphical performance than the native binary version. Follow the directions for Unix compiles in the preceding section. Note that launching RTLBrowser requires Cygserver to be enabled. Please see the Cygwin documentation for information on how to enable Cygserver for your version of Cygwin.

MinGW versus VC++ for Native Binaries

It is recommended that Windows compiles and installs are done in the MinGW environment in order to mimic the Unix shell environment as well as produce binaries that are natively usable on Windows. Producing native binaries with VisualC++ has not been attempted for some time so it is currently untested and might not be supported. Proceed to use VisualC++ at your own risk.

MinGW with GTK-1.2

If you are missing a working version of *gtk-config*, you will need a fake *gtk-config* file in order to compile under GTK-1.2. It will look like this with the include and linker search directories modified accordingly:

```
#!/bin/sh
```

```

if [ "$1" == "--libs" ]
then
    echo -L/home/bybell/libs -lgck -lgdk-1.3 -lgimp-1.2 -lgimpi -lgimpui-1.2
    -lglib-1.3 -lgmodule-1.3 -lgnu-intl -lgobject-1.3 -lgthr
    ead-1.3 -lgtk-1.3 -liconv-1.3 -ljpeg -llibgplugin_a -llibgplugin_b -lpng
    -lpthread32 -ltiff-lzw -ltiff-nolzw -ltiff
fi

if [ "$1" == "--cflags" ]
then
    echo " -mms-bitfields -I/home/bybell/src/glib -I/home/bybell/src/gtk+/gtk
    -I/home/bybell/src/gtk+/gdk -I/home/bybell/src/gtk+ "
fi

```

Compiling as under Unix/Linux is the same however none of the helper applications will be compiled. The .exe file can be found in the *bin/* directory. Copy it to wherever you store binaries on your system. (n.b., **make install** does not work for MinGW.)

MinGW with GTK-2.0

You do not need to do anything special except ensure that *pkg-config* is pointed to by your PATH environment variable. Proceed as with GTK-1.2.

Introduction

GTKWave Overview

GTKWave is an analysis tool used to perform debugging on Verilog or VHDL simulation models. It is not intended to be run interactive with simulation but instead relies on a post-mortem approach through the use of dumpfiles. Various dumpfile formats are supported:

- VCD: Value Change Dump. This is an industry standard file format generated by most Verilog simulators and is specified in IEEE-1364. This is the slowest of the formats for the viewer to process and requires the most memory, however the format is ubiquitous and almost all tools support it.
- LXT: InterLaced eXtensible Trace. This is an optimized format utilizing interleaved back pointers and value changes. Processing LXT files is faster than VCD. It was created specifically for use with GTKWave, however some other simulators (notably, Icarus Verilog) support it natively.
- LXT2: InterLaced eXtensible Trace Version 2. This is a block-based variant of LXT that allows for greater compression and access speeds than can be achieved with LXT. It allows random-access at the block level and also optionally allows partial loading of blocks for even faster operation. Icarus Verilog also supports LXT2 natively.
- VZT: Verilog Zipped Trace. This is an outgrowth of LXT2 as it is also block based, however it employs a different heuristic for compression that allows for file sizes much smaller than most other dumpfile formats including commercial ones. VZT file write performance is the slowest of all the formats, however reading them can be extremely fast on multiprocessor machines as the file format has been designed such that the reader was able to be parallelized.
- GHW: GHDL Wavefile. This is a nine state ("01XZHUWL-") file format written by the VHDL simulator GHDL.
- AET2: All Events Trace Version 2. This is format used by various IBM EDA tools. File size is very small and access is extremely fast. Support for it is

determined at compile time. If the AET2 reader API libraries are not found, it is disabled. Users of IBM toolsets can modify the *./configure3* script to point to the *libae2rw.a* and/or *libae2rw.so* files in order to enable this feature.

Converter helper applications are packaged with the viewer in order to convert VCD files into LXT, LXT2, or VZT files. Conversion from LXT2 and VZT back into VCD is possible. Wholesale conversion from LXT is not currently possible, however it is possible to save the traces visible in the main GTKWave window as VCD so conversion to LXT is not strictly irreversible.

Why Use GTKWave?

GTKWave has been developed to perform debug tasks on large systems on a chip and has been used in this capacity as an offline replacement for third-party debug tools. It is 64-bit clean and is ready for the largest of designs given that it is run on a workstation with a sufficient amount of physical memory. The file formats LXT2 and VZT have been specifically designed to cope with large, real-world designs and AET2 (available to IBM EDA tool users only) has been designed to handle extremely large designs efficiently.

For Verilog, GTKWave allows users to debug simulation results at both the net level by providing a bird's eye view of multiple signal values over varying periods of time and also at the RTL level through annotation of signal values back into the RTL for a given timestep. The RTL browser frees up users from needing to be concerned with the actual location of where a given module resides in the RTL as the view provided by the RTL browser defaults to the module level. This provides quick access to modules in the RTL as navigation has been reduced simply to moving up and down in a tree structure that represents the actual design.

Source code annotation is currently not available for VHDL, however all of GTKWave's other debug features are readily accessible. VHDL support is planned for a future release.

What Is GTKWave?

GTKWave as a collection of binaries is comprised of two interlocking tools: the *gtkwave* viewer application and *rtlbrowse*. In addition, a collection of helper applications are used to facilitate such tasks as file conversions and simulation data mining. They are intended to function together in a cohesive system although their modular design allows each to function independently of the others if need be.

gtkwave is the waveform analyzer and is the primary tool used for visualization. It provides a method for viewing simulation results for both analog and digital data, allows for various search operations and temporal manipulations, can save partial results (i.e., “signals of interest”) extracted from a full simulation dump, and finally can generate PostScript and FrameMaker output for hard copy.

rtlbrowse is used to view and navigate through RTL source code that has been parsed and processed into a stems file by the helper application *vertex*. It allows for viewing of RTL at both the file and module level and when invoked by *gtkwave*, allows for source code annotation.

The helper applications perform various specialized tasks such as file conversion, RTL parsing, and other data manipulation operations considered outside of the scope of what a visualization tool needs to perform.

GTKWave User Interface

GTKWave

Main Window

The GTKWave visualization tool main window is comprised of a menu bar section, a status window, several groups of buttons, a time status section, and signal and wave value sections. New with GTKWave 3.0 is the inclusion of an embedded Signal Search Tree (SST) expander to the left of the signal section. The viewer typically appears as below when the embedded SST is disabled.

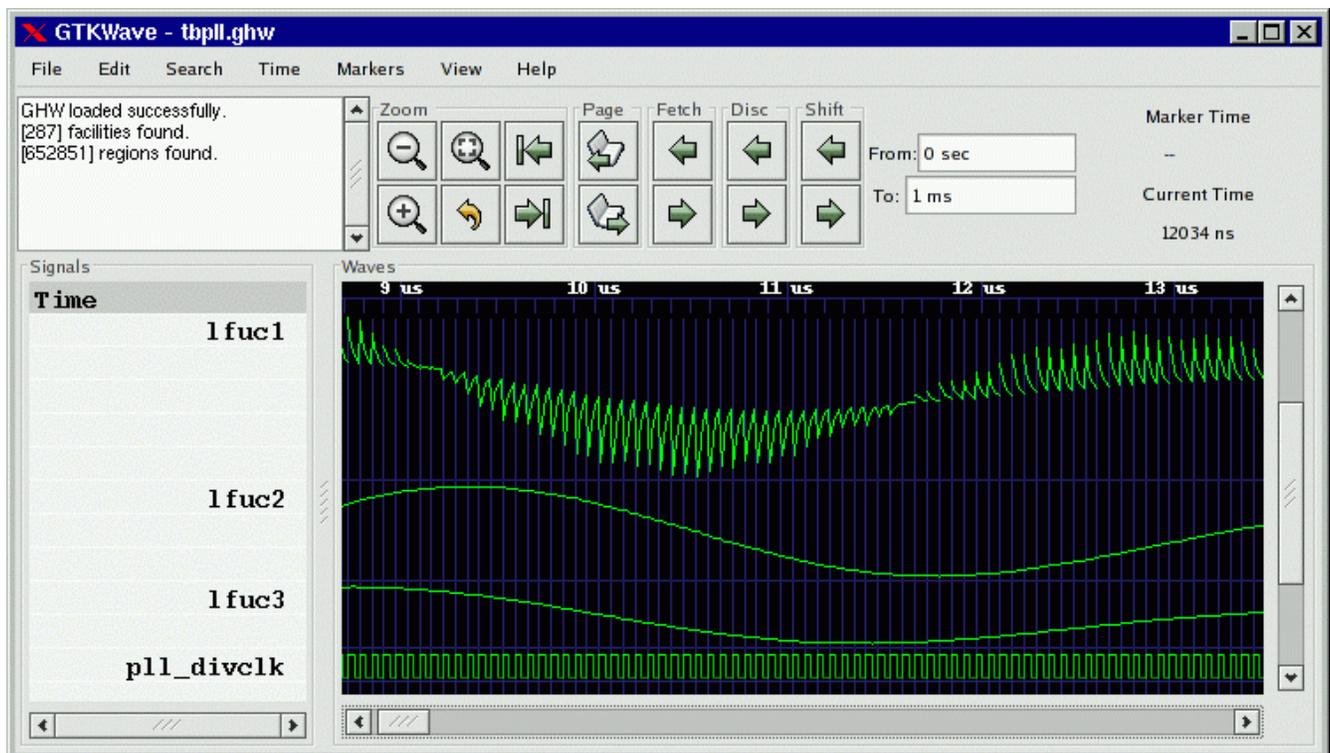


Figure 1: The GTKWave main window

To the extreme left in a frame marked “Signals” is the signal section. Signal names can be left or right aligned (left aligned being useful for detection of hierarchy differences) and the number of levels of hierarchy (as counting from the rightmost side of a signal name) displayed can be set by the user.

To the right of the signal section is the wave section in a frame marked “Waves”. The top line is used as a timescale and all other lines are used to render trace value data with respect to the timescale. The vertical blue lines in the trace value data section are not normally present. In this case they are the result of keying on the rising edge of the digital signal “pll_divclk”. Analog traces of varying heights can be seen as well. Analog traces can dynamically be made as tall or short as desired in order to make the viewing of them easier, however the size is limited to integer multiples of the height of one digital trace.

With GTK versions greater than or equal to 2.4, an embedded SST is available. Drag and Drop of signals from the “Signals” pane inside the SST into the “Signals” pane outside of the SST is a convenient way to import signals into the viewer.

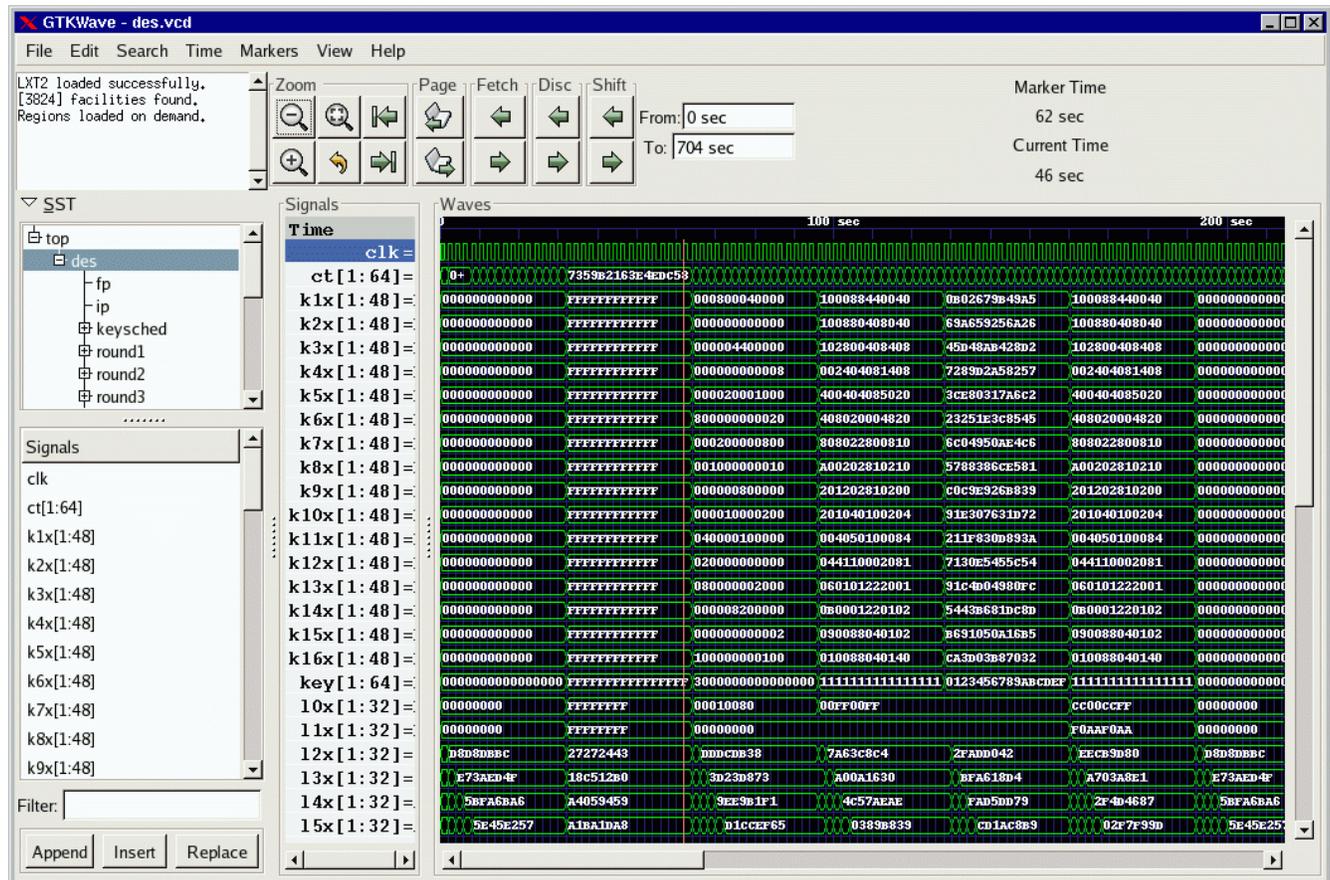


Figure 2: The main window with an embedded SST

The main window size and position can be saved between sessions as well as the current viewer state. (i.e., which signals are visible, any attributes set for those

signals such as alignment and inversion, where the markers are set, and what pattern marking is active.)

Signal Subwindow

The signal subwindow is nothing more than a list of signals, optional comments, and optional blank lines. The following is a sample view of the signal subwindow showing a highlighted trace (“clk”) and a comment trace (in blue with asterisks,

“*** Non-clock traces ***”. In between the two is a blank trace inserted by the user. Note that the highlighting of a trace can be toggled by clicking the left mouse button on an entry in the signal subwindow.

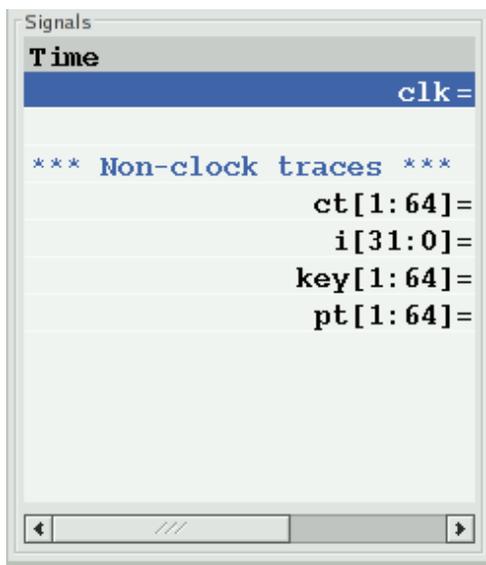


Figure 3: Signal subwindow with scrollbar and an “open” collapsible trace

Groups of traces that start with a comment trace and end with a blank line are considered to be part of a collapsible group. Collapsible groups can be toggled open or closed by holding down the control key and then clicking on the comment trace. When a group is collapsed, the comment trace will be grayed out and the actual traces for that group will be hidden.

You will notice that the scrollbar along the bottom of the subwindow in Figure 3 indicates that there is a hidden section to the right. This hidden area contains the values of the signals

shown. The scrollbar can be manually moved to show this area or the pane to the right of the signal subwindow can be enlarged in order to allow full viewing of the subwindow.

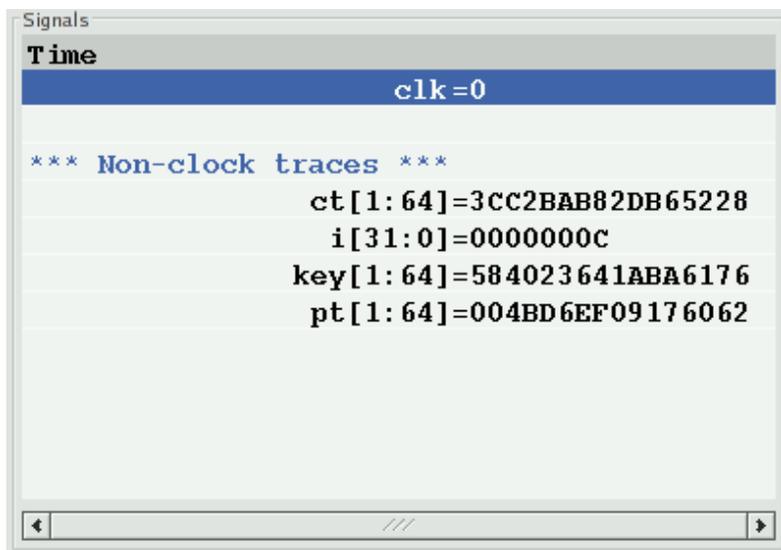


Figure 4: Signal subwindow with no hidden area from left to right

Expanding the size of the subwindow by increasing the width of the pane is illustrated in Figure 4. No area is hidden as reflected by the scrollbar which is completely filled in from left to right along its length. In addition, the signal values which are present can be read. Any time the primary marker is nailed down, there will be an equals (“=”) sign

indicating that signal values are present.

As seen in both Figure 3 and Figure 4, the signal names are right justified and are flush against the equals signs. This is only a matter of personal preference, and if desired, as shown in Figure 5, the signals can be left justified against the left margin of the signal subwindow by pressing the key combination of Shift-Home. This is useful when looking at signals if one is attempting to determine where hierarchies for different net names differ. Press Shift-End to right justify the signal names. (Right justification is the default behavior). Regardless of the state of signal name justification, the signal values are left justified against the equals sign and cannot be moved.

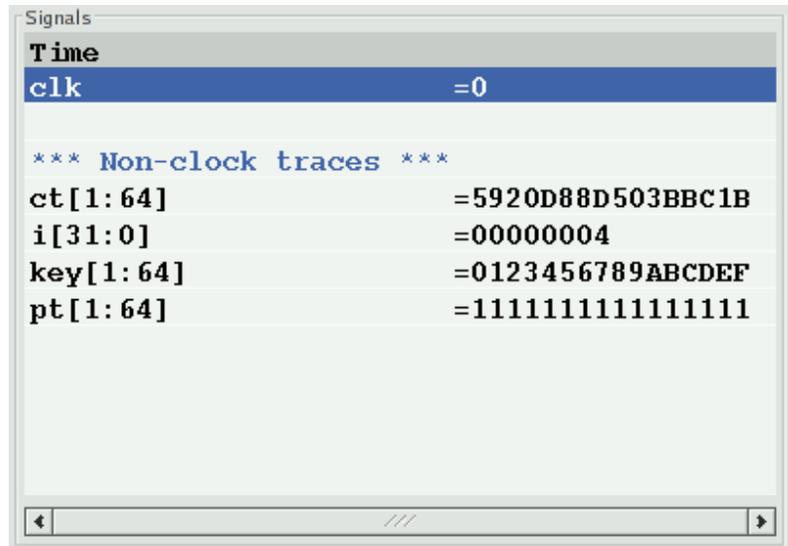


Figure 5: Signal subwindow with left justified signal names

Note that the signal subwindow supports a form of self-contained Drag and Drop such that the right mouse button can be used to harvest all the highlighted traces in the window. By holding the right button and moving the mouse up and down, a destination for the traces can be selected. When the mouse button is released, the traces are dropped at the trace following the one the mouse pointer is pointing to.

Multiple traces can be selected by marking the first trace to highlight, move the cursor to the destination trace, and Shift click with the left mouse button. All the traces between the two will highlight or unhighlight accordingly. To highlight all the traces in the signal subwindow, Alt-H can be pressed. To unhighlight them, also press the Shift key in conjunction with Alt-H. (This can also be achieved by clocking on Highlight All or Unhighlight All in the Edit menu.)

Highlighting or unhighlighting traces by entering regular expressions will be covered in the menu section.

Wave Subwindow

The wave subwindow reformats simulation data into a visual format similar to that seen for digital storage scopes. As seen in Figure 6, the wave subwindow

contains two scrollbars and a viewing area.

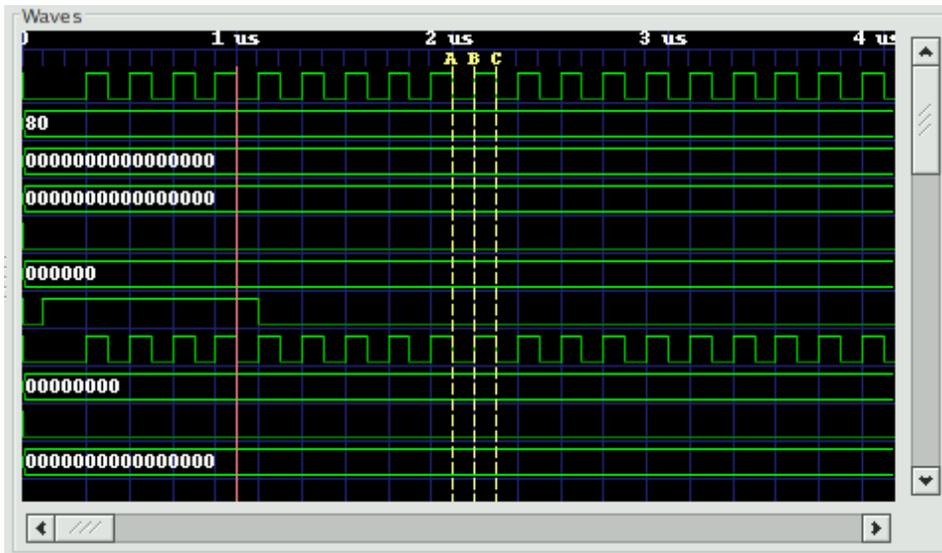


Figure 6: A typical view of the wave subwindow

The scrollbar on the right scrolls not only the wave subwindow, but the signal subwindow in lockstep as well. The scrollbar on the bottom is used to scroll the simulation data with respect to the timescale that is shown on the top line of the wave subwindow.

The simulation data itself is shown as a horizontal series of traces. Values for multi-bit signals can be displayed in varying numeric bases such as binary, octal, hexadecimal, decimal, and ASCII. Values for single-bit traces are shown as “high” for zero and “low” for one, “z” (middle), and “x” (filled-in box). VHDL values are represented in a similar fashion but with different colors. The signal subwindow can always be used to verify the value of a value, so don't be too concerned right now if you are not sure of what the single-bit representation of a signal looks like or are not sure if you can remember.

Two functional markers are available: the primary marker (red, left mouse button) which the signal window uses as its pointer for value data, and the baseline marker (white, middle mouse button) which is used to perform time measurements with respect to the primary marker. Twenty-six lettered markers “A” through “Z” (dropped or collected through menu options) are provided to the user as convenience markers for indexing various points of interest in a simulation.

The primary marker can also be used to navigate with respect to time. It can be dropped with the right mouse button and dragged to “open” up a region for zooming in closer or out farther in time. It can also be used to scroll by holding down the left mouse button and dragging the mouse outside the signal subwindow. The simulation data outside of the window will then scroll into view with the scrolling being in the opposite direction that the primary marker is

“pulling” outside of the subwindow.

Trace data in the signal subwindow can also be timeshifted as shown in Figure 7. In order to timeshift a trace, highlight the trace in the signal window then move over to the wave subwindow and then hold down the left mouse button in order to set the primary marker. Press the Ctrl key then move the primary marker left or right. When the timeshift is as desired, release the mouse button then release Ctrl. If you do not wish to go through with the timeshift, release the Ctrl key before releasing the left mouse button. The trace(s) will then spring back to their original pre-shifted position.

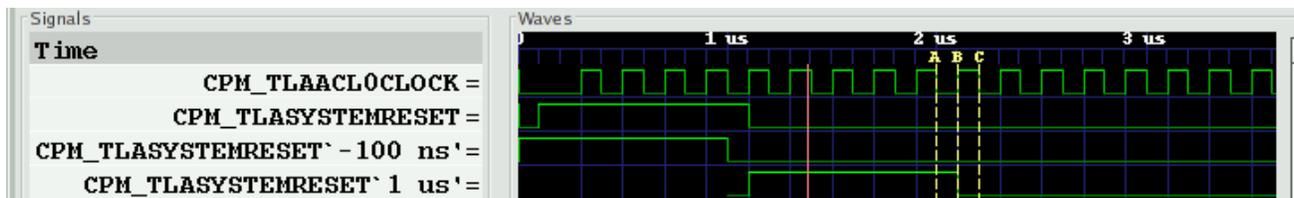


Figure 7: An example of both positively and negatively timeshifted traces

To achieve a finer level of granularity for timeshifting, menu options are available that allow the user to set specific values for a time shift. In this way, the pixel resolution of zoom is not the limiting factor in achieving an “exact” shift that suits a user's needs.

Navigation and Status Panel

The navigation and status panel occupies the top part of the main window just below the menu bar.



Figure 8: The Navigation and Status Panel

The leftmost part contains a status window used for displaying various relevant messages to the user such as the dumpfile type, the number of facilities (nets) in a dumpfile, and any other information such as an operation that fails or completes successfully.

The Zoom subframe contains six buttons. Three are magnifying glass icons. The one marked with a minus (“-”) zooms out which displays a larger amount of simulation time. The one marked with a plus (“+”) zooms in closer, displaying less simulation time. The one with a square in it is “Zoom Full” which is used either to zoom out to display the full range of simulation time or zooms between the primary and baseline marker when the baseline marker is set. The

remaining non-magnifying glass buttons are a back arrow which is a zoom undo. The left arrow “zooms” to the start time of simulation and the right arrow zooms to the end time. The left and right arrows do not affect the zoom level in or out like the plus and minus buttons do; they simply are a shortcut to keep from having to move the scrollbar at the bottom of the wave subwindow.

The Page subframe contains left and right arrows. It scrolls the wave window left or right the granularity of one page. It is similar to clicking to the left or right of the “visible” gadget in a scrollbar, however, given the limited resolution of the GTK scrollbar (floating point), for simulations that have large time values, it might be necessary to use the page buttons rather than the scrollbar.

The Shift subframe contains similar arrows that scroll the display one pixel or timestep (depending on what the zoom level is).

The “From” and “To” boxes indicate the start and end times for what part of the simulation run shall be visible and can be navigated inside the wave subwindow. Values can directly be entered into these boxes and units (e.g., ns, ps, fs) can also be affixed to values.

The Fetch and Discard subframes modify the “From” and “To” box times. Clicking the left Fetch arrow decreases the “From” value. Clicking the right Fetch arrow increases the “To” value. Clicking the left Discard value increases the “From” value and clicking the right Discard button decreases the “To” value.

The Marker Time label indicates where the primary marker is located. If it is not present, a double-dash (“--”) is displayed. The Current Time label indicates where the mouse is pointing. Its function is to determine the time under the cursor without having to activate or move the primary marker. Note that when the primary marker is being click-dragged, the Marker Time label will indicate the delta time off the initial marker click.

When the baseline marker is set, the Marker Time and Current Time labels change. The Marker time label indicates the delta time between the baseline marker and the primary marker. The Current Time label is replaced with a Base Time label that indicates the value of the baseline marker.

Menu Bar

There are seven submenus in the menu bar: File, Edit, Search, Time, Markers, View, and Help. The functions of the individual items in each of those submenus will be covered in GTKWave Menu Functions on page 25.

RTLBrowse

rtlbrowse is usually called as a helper application by *gtkwave*. In order to use RTLBrowse, Verilog source code must first be compiled with *vertex* in order to generate a stems file. A stems file contains hierarchy and component instantiation information used to navigate quickly through the source code. If GTKWave is started with the `--stems` option, the stems file is parsed and *rtlbrowse* is launched.

The main window for RTLBrowse depicts the design as a tree-like structure. (See Figure 9: The RTLBrowse RTL Design Hierarchy window on page 22.) Nodes in the tree may be clicked open or closed in order to navigate through the design hierarchy. Missing modules (unparsed, but instantiated as components) will be marked as “[MISSING]”.

When an item is selected, another window is opened showing only the source code the selected module. If the primary marker is set, then the source code will be annotated with values as shown in Figure 10: Source code annotated by RTLBrowse on page 23. The values shown are the full, wide value of the signal. RTLBrowse currently does not perform bit extractions on multi-bit vectors. If it is desired to see the full source code file for a module, click on the “View Full File” button at the bottom of the window.

Note that it is possible to descend deeper into the design hierarchy by selecting the component name in the annotated or unannotated source code.

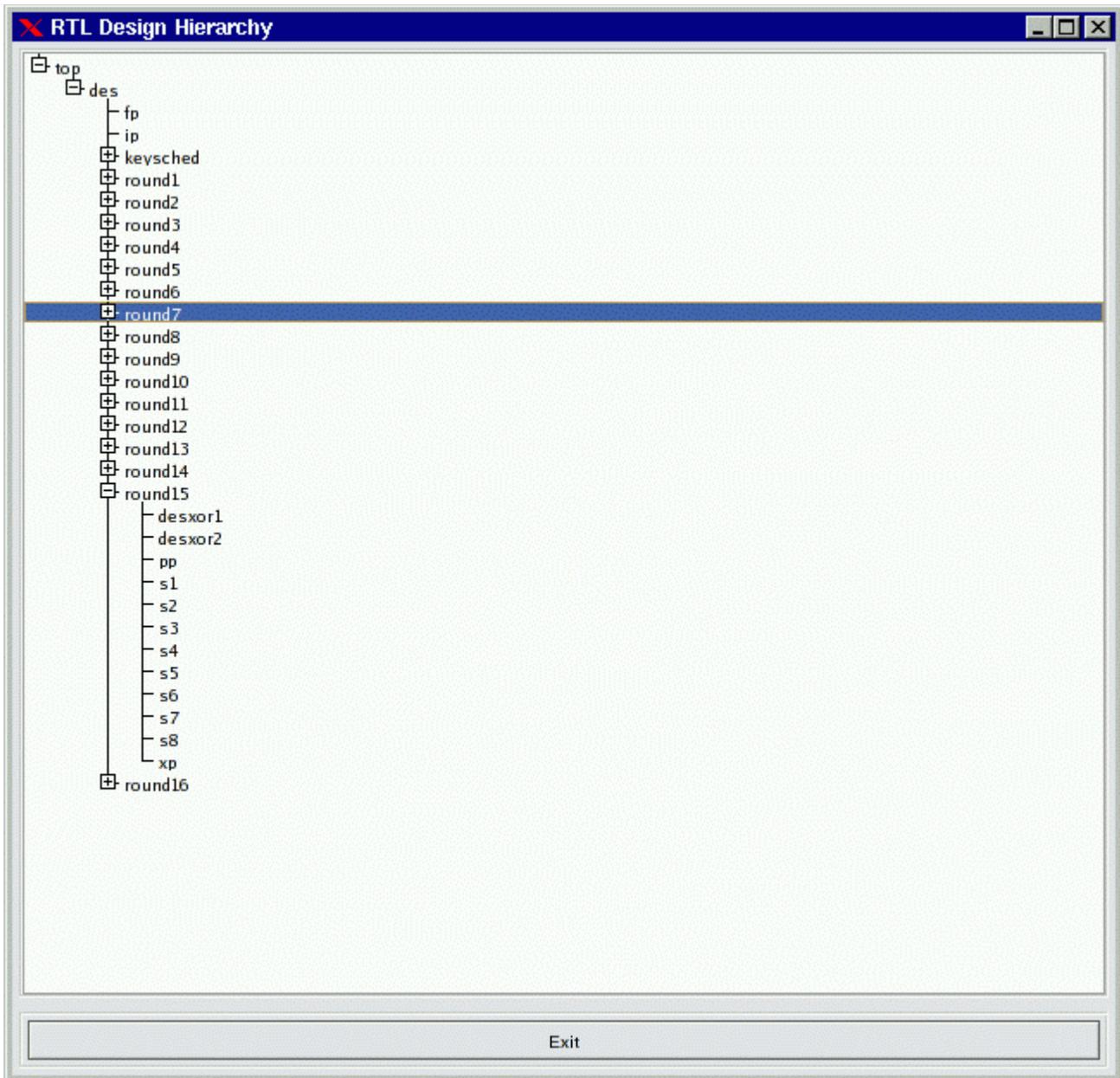


Figure 9: The RTL Browse RTL Design Hierarchy window

```

top.des.round7
/tmp/verilog-0.8.2/examples/des.v
Design unit roundfunc occupies lines 991 - 1017.
Marker time for 'des.vcd.lx2' is 336 sec.

module roundfunc(clk[b1], li[28E7D50F], ri[E44F2DA9], lo[E44F2DA9], ro[B204237A], k[614800D8547F]);
input clk[b1];
input [1:32] li[28E7D50F], ri[E44F2DA9];
input [1:48] k[614800D8547F];
output [1:32] lo[E44F2DA9], ro[B204237A];

wire [1:48] e[F0825E95BD53];
wire [1:6] b1x[24], b2x[1C], b3x[29], b4x[1E], b5x[13], b6x[1E], b7x[24], b8x[2C];
wire [1:4] so1x[E], so2x[5], so3x[6], so4x[F], so5x[0], so6x[B], so7x[B], so8x[E];
wire [1:32] ppo[9AE3F675];

xp xp(ri[E44F2DA9], e[F0825E95BD53]);
desxor1 desxor1(e[F0825E95BD53], b1x[24], b2x[1C], b3x[29], b4x[1E], b5x[13], b6x[1E], b7x[24], b8x[2C], k[614800D8547F]);
s1 s1(clk[b1], b1x[24], so1x[E]);
s2 s2(clk[b1], b2x[1C], so2x[5]);
s3 s3(clk[b1], b3x[29], so3x[6]);
s4 s4(clk[b1], b4x[1E], so4x[F]);
s5 s5(clk[b1], b5x[13], so5x[0]);
s6 s6(clk[b1], b6x[1E], so6x[B]);
s7 s7(clk[b1], b7x[24], so7x[B]);
s8 s8(clk[b1], b8x[2C], so8x[E]);
pp pp(so1x[E], so2x[5], so3x[6], so4x[F], so5x[0], so6x[B], so7x[B], so8x[E], ppo[9AE3F675]);
desxor2 desxor2(ppo[9AE3F675], li[28E7D50F], ro[B204237A]);

assign lo[E44F2DA9]=ri[E44F2DA9];

endmodule
View Full File

```

Figure 10: Source code annotated by RTLBrowse

Ergonomic Extras

Scroll Wheels

Users with a scroll wheel mouse have some extra one-handed operations options available which correspond to some functions found in the Navigation and Status Panel description on page 19.

- Shift Right – Ctrl + scroll wheel down
- Shift Left – Ctrl + scroll wheel up
- Page Right – scroll wheel down
- Page Left – scroll wheel up
- Zoom In – Alt + scroll wheel down
- Zoom Out – Alt + scroll wheel up

Turning the scroll wheel “presses” the shift, page, and zoom options repeatedly far faster than is possible with the navigation buttons. Zoom functions are especially smooth this way.

The Primary Marker

The primary marker has also had function overloaded onto it for user convenience. Besides being used as a marker, it can also be used to navigate with respect to time. It can be dropped with the right mouse button and dragged to “open” up a region for zooming in closer or out farther in time. It can also be used to scroll by holding down the left mouse button and dragging the mouse outside the signal subwindow. The simulation data outside of the window will then scroll into view with the scrolling being in the opposite direction that the primary marker is “pulling” outside of the subwindow.

GTKWave Menu Functions

File

The File submenu contains various items related to the accessing of files, printing, and application respawning and exiting.

Open New Viewer will open a file requester that will ask for the name of a VCD or AET file to view. This will fork off a new viewer process.

Export-Write VCD File As will open a file requester that will ask for the name of a VCD dumpfile. The contents of the dumpfile generated will be the vcd representation of the traces onscreen that can be seen by manipulating the signal and wavewindow scrollbars. The data saved corresponds to the trace information needed to allow viewing when used in tandem with the corresponding GTKWave save file.

Export-Write LXT File As will open a file requester that will ask for the name of an LXT dumpfile. The contents of the dumpfile generated will be the vcd representation of the traces onscreen that can be seen by manipulating the signal and wavewindow scrollbars. The data saved corresponds to the trace information needed to allow viewing when used in tandem with the corresponding GTKWave save file.

Print To File will open up a requester that will allow you to select print options (PS or MIF; Letter, A4, or Legal; Full or Minimal). After selecting the options you want, a file requester will ask for the name of the output file to generate that reflects the current main window display's contents.

Read Save File will open a file requester that will ask for the name of a GTKWave save file. The contents of the save file will determine which traces and vectors as well as their format (binary, decimal, hex, reverse, etc.) are to be appended to the display. Note that the marker positional data and zoom factor present in the save file will replace any current settings.

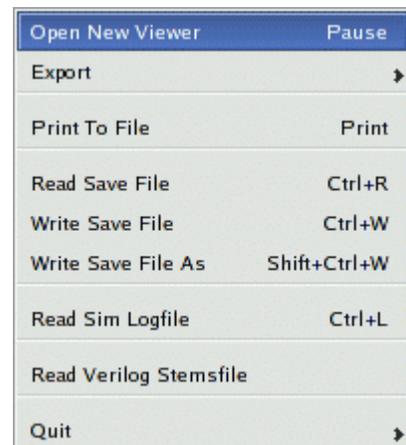


Figure 11: The File submenu

Write Save File will invoke Write Save File As if no save file name has been specified previously. Otherwise it will write the save file data without prompting.

Write Save File As will open a file requester that will ask for the name of a GTKWave save file. The contents of the save file generated will be the traces as well as their format (binary, decimal, hex, reverse, etc.) which are currently a part of the display. Marker positional data and the zoom factor are also a part of the save file.

Read Logfile will open a file requester that will ask for the name of a plaintext simulation log. By clicking on the numbers in the logfile, the marker will jump to the appropriate time value in the wave window.

Read Verilog Stemsfile will open a file requester that will ask for the name of a Verilog stemsfile. This will then launch an RTL browser and allow sourcecode annotation based on the primary marker position. Stems files are generated by Vertex. Please see its manpage for syntax and more information on stems file generation.

Quit exits GTKWave after an additional confirmation requester is given the OK to quit.

Edit

The Edit submenu is used to perform sorts on net names, perform various utility functions such as attaching disassemblers and other external programs to GTKWave, and to change the data representation of values in the wave subwindow.

Set Max Hier sets the maximum hierarchy depth (counting from the right with bit numbers or ranges ignored) that is displayable for trace names. Zero indicates that no truncation will be performed (default). Note that any aliased signals (prefix of a "+") will not have truncated names.

Insert Blank inserts a blank trace after the last highlighted trace. If no traces are highlighted, the blank is inserted after the last trace.

Insert Comment inserts a comment trace after the last highlighted trace. If no traces are highlighted, the comment is inserted after the last trace.

Insert Analog Height Extension inserts a blank

Set Trace Max Hier	Ctrl+T
Insert Blank	Ctrl+B
Insert Comment	Ctrl+C
Insert Analog Height Extension	Ctrl+A
Alias Highlighted Trace	Alt+A
Remove Highlighted Aliases	Shift+Alt+A
Cut	Alt+C
Paste	Alt+P
Expand	F3
Combine Down	F4
Combine Up	F5
Reduce Single Bit Vectors	F6
Data Format	▶
Show-Change All Highlighted	Ctrl+S
Show-Change First Highlighted	Ctrl+F
Time Warp	▶
Exclude	Shift+Alt+E
Show	Shift+Alt+S
Expand All Groups	F12
Collapse All Groups	Shift+F12
Highlight Regexp	Alt+R
UnHighlight Regexp	Shift+Alt+R
Highlight All	Alt+H
UnHighlight All	Shift+Alt+H
Sort	▶

Figure 12: The Edit submenu

analog extension trace after the last highlighted trace. If no traces are highlighted, the blank is inserted after the last trace. This type of trace is used to increase the height of analog traces.

Alias Highlighted Trace only works when at least one trace has been highlighted. With this function, you will be prompted for an alias name for the first highlighted trace. After successfully aliasing a trace, the aliased trace will be unhighlighted. Single bits will be marked with a leading "+" and vectors will have no such designation. The purpose of this is to provide a fast method of determining which trace names are real and which ones are aliases.

Remove Highlighted Aliases only works when at least one trace has been highlighted. Any aliased traces will have their names restored to their original names. As vectors get their names from aliases, vector aliases will not be removed.

Cut removes highlighted signals from the display and places them in an offscreen cut buffer for later Paste operations. Cut implicitly destroys the previous contents of the cut buffer.

Paste pastes signals from an offscreen cut buffer and places them in a group after the last highlighted signal, or at the end of the display if no signal is highlighted. Paste implicitly destroys the previous contents of the cut buffer.

Expand decomposes the highlighted signals into their individual bits. The resulting bits are converted to traces and inserted after the last highlighted trace. The original unexpanded traces will be placed in the cut buffer. It will function seemingly randomly when used upon real valued single-bit traces. When used upon multi-bit vectors that contain real valued traces, those traces will expand to their normal "correct" values, not individual bits.

Combine Down coalesces the highlighted signals into a single vector named "<Vector>" in a top to bottom fashion placed after the last highlighted trace. The original traces will be placed in the cut buffer. It will function seemingly randomly when used upon real valued single-bit traces.

Combine Up coalesces the highlighted signals into a single vector named "<Vector>" in a bottom to top fashion placed after the last highlighted trace. The original traces will be placed in the cut buffer. It will function seemingly randomly when used upon real valued single-bit traces.

Reduce Single Bit Vectors decomposes the highlighted traces into their individual bits only if the highlighted traces are one bit wide vectors. In effect, this function allows single-bit vectors to be viewed as signals. The resulting bits are converted to traces and inserted after the last converted trace with the pre-conversion traces being placed in the cut buffer.

Data Format-Hex will step through all highlighted traces and ensure that vectors with this qualifier will be displayed with hexadecimal values.

Data Format-Decimal will step through all highlighted traces and ensure that vectors with this qualifier will be displayed with decimal values.

Data Format-Signed will step through all highlighted traces and ensure that vectors with this qualifier will be displayed as sign extended decimal values.

Data Format-Binary will step through all highlighted traces and ensure that vectors with this qualifier will be displayed with binary values.

Data Format-Octal will step through all highlighted traces and ensure that vectors with this qualifier will be displayed with octal values.

Data Format-ASCII will step through all highlighted traces and ensure that vectors with this qualifier will be displayed with ASCII values.

Data Format-Right Justify-On will step through all highlighted traces and ensure that vectors with this qualifier will be displayed right justified.

Data Format-Right Justify-Off will step through all highlighted traces and ensure that vectors with this qualifier will not be displayed right justified.

Data Format-Invert-On will step through all highlighted traces and ensure that bits and vectors with this qualifier will be displayed with 1's and 0's inverted.

Data Format-Invert-Off will step through all highlighted traces and ensure that bits and vectors with this qualifier will not be displayed with 1's and 0's inverted.

Data Format-Reverse Bits-On will step through all highlighted traces and ensure that vectors with this qualifier will be displayed in reversed bit order.

Data Format-Reverse Bits-Off will step through all highlighted traces and ensure that vectors with this qualifier will not be displayed in reversed bit order.

Translate Filter File Disable will remove translation filtering used to reconstruct enums for marked traces.

Translate Filter File will enable translation on marked traces using a filter file. A requester will appear to get the filter filename.

Translate Filter Process Disable will remove translation filtering used to reconstruct enums for marked traces.

Translate Filter Process will enable translation on marked traces using a filter process. A requester will appear to get the filter filename.

Analog Off causes the waveform data for all currently highlighted traces to be displayed as normal.

Analog Step causes the waveform data for all currently highlighted traces to be displayed as stepwise analog waveform.

Analog Interpolate causes the waveform data for all currently highlighted traces to be displayed as interpolated analog waveform.

Show-Change All Highlighted provides an easy means of changing trace attributes en masse. Various functions are provided in a Show-Change requester.

Show-Change First Highlighted provides a means of changing trace attributes for the first highlighted trace. Various functions are provided in a Show-Change

requester. When a function is applied, the trace will be unhighlighted.

Warp Marked offsets all highlighted traces by the amount of time entered in the requester. (Positive values will shift traces to the right.) Attempting to shift greater than the absolute value of total simulation time will cap the shift magnitude at the length of simulation. Note that you can also warp traces dynamically by holding down CTRL and dragging a group of highlighted traces to the left or right with the left mouse button pressed. When you release the mouse button, if CTRL is pressed, the drag warp commits, else it reverts to its pre-drag condition.

Unwarp Marked removes all offsets on all highlighted traces.

Unwarp All unconditionally removes all offsets on all traces.

Exclude causes the waveform data for all currently highlighted traces to be blanked out.

Show causes the waveform data for all currently highlighted traces to be displayed as normal if the exclude attribute is currently set on the highlighted traces.

Expand All Groups causes all groups defined by comment traces to expand. Groups are manually toggled collapsed and uncollapsed individually by holding down CTRL and pressing the left mouse button on a comment trace.

Collapse All Groups causes all groups defined by comment traces to collapse. Groups are manually toggled collapsed and uncollapsed individually by holding down CTRL and pressing the left mouse button on a comment trace.

Highlight Regexp brings up a text requester that will ask for a regular expression that may contain text with POSIX regular expressions. All traces meeting this criteria will be highlighted.

UnHighlight Regexp brings up a text requester that will ask for a regular expression that may contain text with POSIX regular expressions. All traces meeting this criteria will be unhighlighted if they are currently highlighted.

Highlight All simply highlights all displayed traces.

UnHighlight All simply unhighlights all displayed traces.

Alphabetize All alphabetizes all displayed traces. Blank traces are sorted to the bottom.

Alphabetize All (CaseIns) alphabetizes all displayed traces without regard to case. Blank traces are sorted to the bottom.

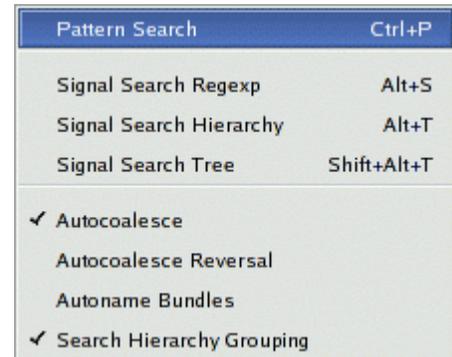
Sigsort All sorts all displayed traces with the numeric parts being taken into account. Blank traces are sorted to the bottom.

Reverse All reverses all displayed traces unconditionally.

Search

The Search submenu is used to perform searches on net names and values.

Pattern Search only works when at least one trace is highlighted. A requester will appear that lists all the selected traces (maximum of 500) and allows various criteria to be specified for each trace. Searches can go forward or backward from the primary (unnamed) marker. If the primary marker has not been set, the search starts at the beginning of the displayed data ("From") for a forwards search and starts at the end of the displayed data ("To") for a backwards search. "Mark" and "Clear" are used to modify the normal time vertical markings such that they can be used to indicate all the times that a specific pattern search condition is true (e.g., every upclock of a specific signal). The "Mark Count" field indicates how many times the specific pattern search condition was encountered. The "Marking Begins at" and "Marking Stops at" fields are used to limit the time over which marking is applied (but they have no effect on searching).



Pattern Search	Ctrl+P
Signal Search Regexp	Alt+S
Signal Search Hierarchy	Alt+T
Signal Search Tree	Shift+Alt+T
<input checked="" type="checkbox"/> Autocoalesce	
Autocoalesce Reversal	
Autoname Bundles	
<input checked="" type="checkbox"/> Search Hierarchy Grouping	

Figure 13: The Search submenu

Signal Search Regexp provides an easy means of adding traces to the display. Various functions are provided in the Signal Search requester which allow searching using POSIX regular expressions and bundling (coalescing individual bits into a single vector).

Signal Search Hierarchy provides an easy means of adding traces to the display in a text based treelike fashion.

Signal Search Tree provides an easy means of adding traces to the display. Various functions are provided in the Signal Search Tree requester which allow searching a treelike hierarchy and bundling (coalescing individual bits into a single vector).

Autocoalesce when enabled allows the wave viewer to reconstruct split vectors. Split vectors will be indicated by a "[" prefix in the search requesters.

Autocoalesce Reversal causes split vectors to be reconstructed in reverse order (only if autocoalesce is also active). This is necessary with some simulators. Split vectors will be indicated by a "[" prefix in the search requesters.

Autoname Bundles when enabled modifies the bundle up/down operations in the hierarchy and tree searches such that a NULL bundle name is implicitly created which informs GTKWave to create bundle and signal names based on the position in the hierarchy. When disabled, it modifies the bundle up/down operations in the hierarchy and tree searches such that a NULL bundle name is not implicitly created. This informs GTKWave to create bundle and signal names based on the position in the hierarchy only if the user enters a zero-length bundle name. This behavior is the default.

Search Hierarchy Grouping when enabled ensures that new members added to the ``Tree Search`` and ``Hierarchy Search`` widgets are added alphanumerically: first hierarchy names as a group followed by signal names as a group. This is the

default and is recommended. When disabled, hierarchy names and signal names are interleaved together in strict alphanumerical ordering. Note that due to the caching mechanism in ``Tree Search'', dynamically changing this flag when the widget is active may not produce immediately obvious results. Closing the widget then opening it up again will ensure that it follows the behavior of this flag.

Time

The Time submenu contains a superset of the functions performed by the Navigation and Status Panel button groups (see page 19).

Move To Time scrolls the waveform display such that the left border is the time entered in the requester.

Zoom Amount allows entry of zero or a negative value for the display zoom. Zero is no magnification.

Zoom Base allows entry of a zoom base for the zoom (magnification per integer step) Allowable values are 1.5 to 10.0. Default is 2.0.



Figure 14: The Time submenu

Zoom In is used to increase the zoom factor. Alt + Scrollwheel Down also performs this function.

Zoom Out is used to decrease the zoom factor. Alt + Scrollwheel Up also performs this function.

Zoom Full attempts a "best fit" to get the whole trace onscreen. Note that the trace may be more or less than a whole screen since this isn't a "perfect fit."

Zoom Best Fit attempts a "best fit" to get the whole trace onscreen. Note that the trace may be more or less than a whole screen since this isn't a "perfect fit." Also, if the middle button baseline marker is nailed down, the zoom instead of getting the whole trace onscreen will use the part of the trace between the primary marker and the baseline marker.

Zoom To Start is used to jump scroll to the trace's beginning.

Zoom To End is used to jump scroll to the trace's end.

Zoom Undo is used to revert to the previous zoom value used. Undo only works one level deep.

Fetch Size brings up a requester which allows input of the number of ticks used for fetch/discard operations. Default is 100.

Fetch Right increases the "To" time, which allows more of the trace to be displayed if the "From" and "To" times do not match the actual bounds of the trace.

Fetch Left decreases the "From" time, which allows more of the trace to be displayed if the "From" and "To" times do not match the actual bounds of the trace.

Discard Right decreases the "To" time, which allows less of the trace to be displayed.

Discard Left increases the "From" time, which allows less of the trace to be displayed.

Shift Right scrolls the display window right one tick worth of data. The net action is that the data scrolls left a tick. Ctrl + Scrollwheel Down also performs this function.

Shift Left scrolls the display window left one tick worth of data. The net action is that the data scrolls right a tick. Ctrl + Scrollwheel Up also performs this function.

Page Right scrolls the display window right one page worth of data. The net action is that the data scrolls left a page. Scrollwheel Down also performs this function.

Page Left scrolls the display window left one page worth of data. The net action is that the data scrolls right a page. Scrollwheel Up also performs this function.

Markers

The Markers submenu is used to perform various manipulations on the markers as well as control scrolling offscreen.

Show-Change Marker Data displays and allows the modification of the times for all 26 named markers. The time for each marker must be unique.

Drop Named Marker drops a named marker where the current primary (unnamed) marker is placed. A maximum of 26 named markers are allowed and the times for all must be different.

Collect Named Marker collects a named marker where the current primary (unnamed) marker is placed if there is a named marker at its position.

Collect All Named Markers simply collects any and all named markers which have been dropped.

Delete Primary Marker removes the primary marker from the display if present.

Wave Scrolling allows movement of the primary marker beyond screen boundaries which causes the wave window to scroll when enabled. When disabled, it disallows movement of the primary marker beyond screen boundaries.

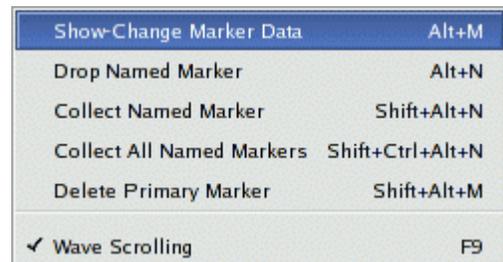


Figure 15: The Markers submenu

View

The View submenu is used to control various attributes dealing with the graphical rendering of status items as well as values in the signal subwindow.

Show Grid toggles the drawing of gridlines in the waveform display.

Show Base Symbols enables the display of leading base symbols ('\$' for hex, '%' for binary, '#' for octal) if they are turned off and disables the drawing of leading base symbols if they are turned on. Base symbols are displayed by default.

Dynamic Resize allows GTKWave to dynamically resize the signal window for you when toggled active. This can be helpful during numerous signal additions and/or deletions. This is the default behavior.

Center Zooms when enabled configures zoom in/out operations such that all zooms use the center of the display as the fixed zoom origin if the primary (unnamed) marker is not present, otherwise, the primary marker is used as the center origin. When disabled, it configures zoom in/out operations such that all zooms use the left margin of the display as the fixed zoom origin.

Toggle Max-Marker allows you to switch between the maximum time and marker time for display in the upper right corner of the main window. Default behavior is that the maximum time is displayed.

Constant Marker Update when enabled, allows GTKWave to dynamically show the changing values of the traces under the primary marker while it is being dragged across the screen. This works best with dynamic resizing disabled. When disabled, it restricts GTKWave to only update the trace values when the left mouse button is initially pressed then again when it is released. This is the default behavior.

Draw Roundcapped Vectors draws vector transitions that have sloping edges when enabled. Draws vector transitions that have sharp edges when disabled; this is the default.

Left Justify Signals draws signal names flushed to the left border of the signal window.

Right Justify Signals draws signal names flushed to the right ("equals") side of the signal window.

Zoom Pow10 Snap snaps time values to a power of ten boundary when active. Fractional zooms are internally stored, but what is actually displayed will be rounded up/down to the nearest power of 10. This only works when the ticks per



<input checked="" type="checkbox"/> Show Grid	Alt+G
Show Base Symbols	Alt+F1
<input checked="" type="checkbox"/> Dynamic Resize	Alt+9
<input checked="" type="checkbox"/> Center Zooms	F8
Toggle Max-Marker	F10
<input checked="" type="checkbox"/> Constant Marker Update	F11
<input checked="" type="checkbox"/> Draw Roundcapped Vectors	Alt+F2
Left Justified Signals	Shift+Home
Right Justified Signals	Shift+End
<input checked="" type="checkbox"/> Zoom Pow10 Snap	Shift+Pause
Full Precision	Alt+Pause
Remove Pattern Marks	
LXT Clock Compress to Z	

Figure 16: The View submenu

frame is greater than 100 units.

Full Precision does not round time values when the number of ticks per pixel onscreen is greater than 10 when active. The default is that this feature is disabled.

Remove Pattern Marks removes any vertical traces on the display caused by the Mark feature in pattern search and reverts to the normal format.

LXT Clock Compress to Z reduces memory usage when active as clocks compressed in LXT format are kept at Z in order to save memory. Traces imported with this are permanently kept at Z.

Help

The Help submenu contains options for enabling on-line help as well as displaying program version information.

Wave Help brings up a help window that will show the function of any menu option when that option is selected. Closing the help window will turn off help and return back to normal menu function.

Wave Version merely brings up a requester which indicates the current version of this program.

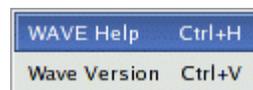


Figure 17: The Help submenu

Quick Start

Sample Design

In the *examples/* directory of the source code distribution a sample Verilog design and testbench for a DES encryptor can be found as *des.v*.

```
10 ~/home/bybell/gtkwave-3.0.0pre21/examples> ls -al
total 132
drwxrwxr-x    2 bybell  bybell    4096 Apr 30 14:12 .
drwxr-xr-x    8 bybell  bybell    4096 Apr 29 22:05 ..
-rw-rw-r--    1 bybell  bybell    187 Apr 29 22:09 des.sav
-rw-r--r--    1 bybell  bybell   47995 Apr 29 22:05 des.v
-rw-rw-r--    1 bybell  bybell   68801 Apr 29 22:06 des.vzt
```

If you have a Verilog simulator handy, you can simulate the design to create a VCD file. To try the example in Icarus Verilog (<http://www.icarus.com>), type the following:

```
/tmp/gtkwave-3.0.0/examples> iverilog des.v && a.out
VCD info: dumpfile des.vcd opened for output.
/tmp/gtkwave-3.0.0/examples> ls -la des.vcd
-rw-rw-r--    1 bybell  bybell   3465481 Apr 30 13:39 des.vcd
```

If you do not have a simulator readily available, you can expand the *des.vzt* file into *des.vcd* by typing the following:

```
/tmp/gtkwave-3.0.0/examples> vzt2vcd des.vzt >des.vcd
VZTLOAD | 1432 facilities
VZTLOAD | Total value bits: 22921
VZTLOAD | Read 1 block header OK
VZTLOAD | [0] start time
VZTLOAD | [704] end time
VZTLOAD |
VZTLOAD | block [0] processing 0 / 704
```

```
/tmp/gtkwave-3.0.0/examples> ls -la des.vcd  
-rw-rw-r--    1 bybell  bybell    3456247 Apr 30 13:42 des.vcd
```

You will notice that the generated VCD file is about fifty times larger than the VZT file. This illustrates the compressibility of VCD files and the space saving advantages of using the database formats that GTKWave supports. Normally we would not want to work with VCD as GTKWave is forced to process the whole file rather than access only the data needed, but in the next section we will show how to invoke GTKWave such that VCD files are automatically converted into LXT2 ones.

Next, let's create a stems file that allows us to bring up RTLBrowse.

```
/tmp/gtkwave-3.0.0/examples> vertex des.v -emitstems >des.stems  
Vertex: Verilog Parser v0.1.0 (w)1999-2006 BSI
```

```
Processing file 'des.v' ...
```

```
/tmp/gtkwave-3.0.0/examples> ls -la des.stems  
-rw-rw-r--    1 bybell  bybell      4662 Apr 30 13:50 des.stems
```

Stems files only need to be generated when the source code undergoes file layout and/or hierarchy changes.

Now that we have a VCD file and a stems file, we can bring up the viewer.

Launching GTKWave

We already have a VZT file available, but to illustrate the automatic conversion of VCD files, let's use the `-o` option. The `-t` option is used to specify the stems file. The `.sav` file is a "save file" that contains GTKWave scope state.

```
/tmp/gtkwave-3.0.0/examples> gtkwave -o -t des.stems des.vcd des.sav
```

```
GTKWave Analyzer v3.0.0 (w)1999-2006 BSI
```

```
Converting VCD File 'des.vcd' to LXT2 file 'des.vcd.lx2'...
```

```
1432 symbols span ID range of 1395, using indexing...
```

```
[0] start time.
```

```
[704] end time.
```

```
LXTLOAD | 1432 facilities
```

```

LXTLOAD | Read 2 block headers OK
LXTLOAD | [0] start time
LXTLOAD | [704] end time
LXTLOAD |
LXTLOAD | Finished building 1432 facs.
LXTLOAD | Merging in 145 aliases.
LXTLOAD | Building facility hierarchy tree.
LXTLOAD | Sorting facility hierarchy tree.
LXTLOAD | 1432 facilities
LXTLOAD | Read 2 block headers OK
LXTLOAD | [0] start time
LXTLOAD | [704] end time
LXTLOAD |

```

You will see two sets of LXTLOAD messages. This is normal as RTLBrowse is launched as an external process in order to keep its operations from bogging down the viewer. After these messages scroll by, the GTKWave main window and an RTLBrowse hierarchy window will appear. We are now ready to start experimenting with various features of the wave viewer and RTLBrowse.

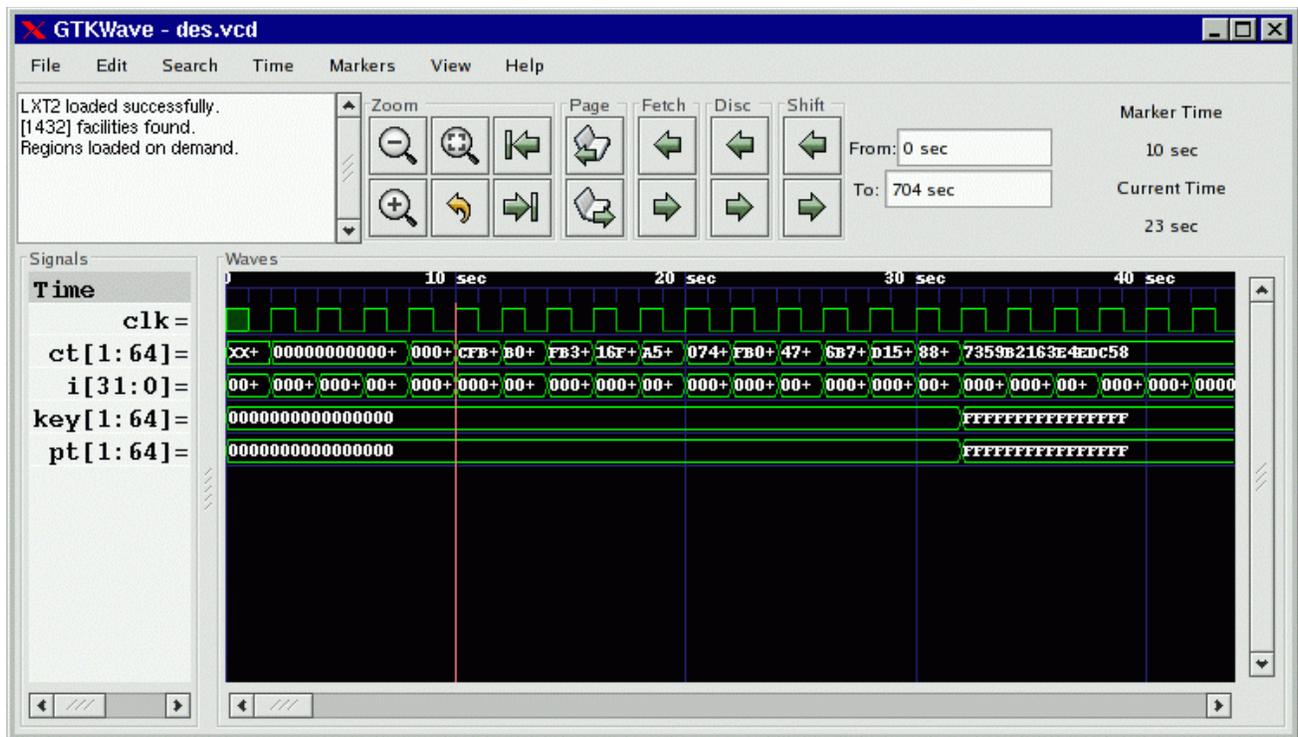


Figure 18: The main window with viewer state loaded from a save file

The RTLBrowse window will come up as seen in Figure 9: The RTLBrowse RTL Design Hierarchy window on page 22, however none of the tree nodes will be opened yet.

Displaying Waveforms

In the preceding section, the viewer was brought up with a save file so when the viewer did appear, the main window already had signals present as seen in Figure 18 on page 37. All the signals in a model do not appear on their own as this would be unwieldy for large models. Instead, it is up to the user to import signals manually. An exception to this exists for VCD files, see the definition of the `enable_vcd_autosave` `.gtkwaverc` variable on page 62. That said, several requesters exist for importing signals into the main window.

Signal Search

The signal search requester accepts a search string as a POSIX regular expression. Any signals found in the dumpfile that match that regular expression are listed in the Matches box and may be individually or multiply selected and imported into the viewer window. The regular expression can be modified in one of four ways: `WRange`, `WStrand`, `Range`, and `Strand`. No modification is possible with `None`. This optionally matches the string you enter in the search string above with a Verilog format range (signal[7:0]), a strand (signal.1, signal.0), or with no suffix. The “W” modifier for “Range” and “Strand” explicitly matches on word boundaries. (addr matches unit.freezeaddr[63:0] for “Range” but only unit.addr[63:0] for “WRange” since addr has to be on a word boundary.) Note that when “None” is selected, the search string may be located anywhere in the signal name.

Append will add the selected signals to end of the display on the main window.

Insert will add selected signals after last highlighted signal on the main window.

Replace will replace highlighted signals on the main window with signals selected.

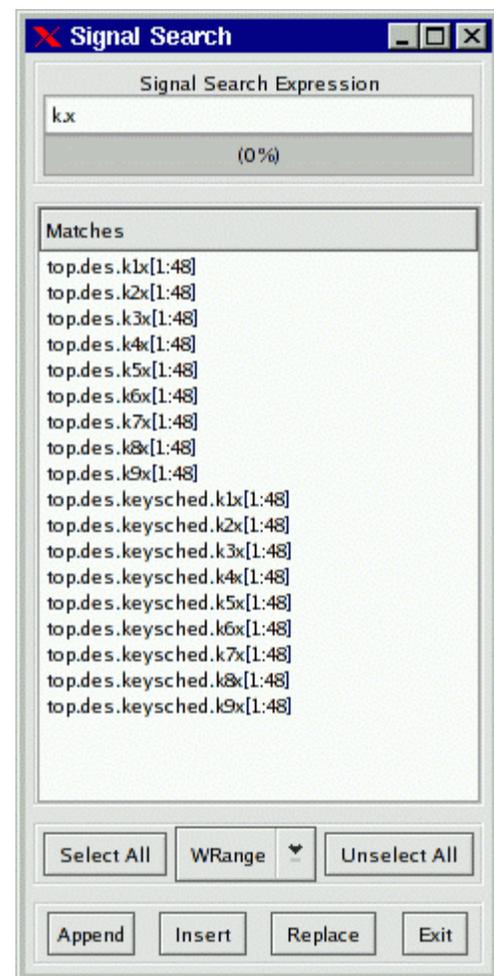


Figure 19: The Signal Search (regular expression search) Requester

Hierarchy Search

The hierarchy search requester provides a view of the hierarchy in a format similar to the current working directory of a file in a filesystem on a computer. The Signal Hierarchy box contains the current hierarchy and the Children box contain all of the signals in that immediate level of hierarchy and all of the component instantiation names for that level of hierarchy (denoted by a “(+)” prefix). To navigate down a level of hierarchy, click on an item with a “(+)” prefix. To move up a level of hierarchy, click on the “..” line.

Selecting individual items allow you to import traces singly when the Append, Insert, or Replace buttons are clicked. Not selecting anything will do a “deep import” such that all the child signals are imported. Use of that feature is not recommended for very large designs.

Note that it is possible to modify the display order such that components and signals are intermixed in this gadget rather than being separated such that all the components for a given level of hierarchy are listed alphabetically at the top and all signals are listed alphabetically at the bottom.

In order to do this, toggle the Search submenu item Search Hierarchy Grouping as described on page 30.

Tree Search

The Tree Search Requester is the requester that most users will feel comfortable using and is also the requester that can optionally be embedded in the main window on versions of GTK greater than or equal to 2.4. See Figure 2: The main window with an embedded SST on page 15 for an example of this.

The Tree Search Requester is composed of a top tree selection box, a signals box, and a POSIX regular expression filter. The tree selection box is used to navigate at the hierarchy level. Click on an item in order to show the signals at that level of hierarchy. In the figure on page 40, the “top” level of hierarchy is selected and the signals box shows what signals are available at that level of hierarchy. Signals may be individually or multiply selected and can be dragged and dropped into the signal window. In addition, a POSIX filter can be specified that allows the selective filtering of signal names at a level of hierarchy which is

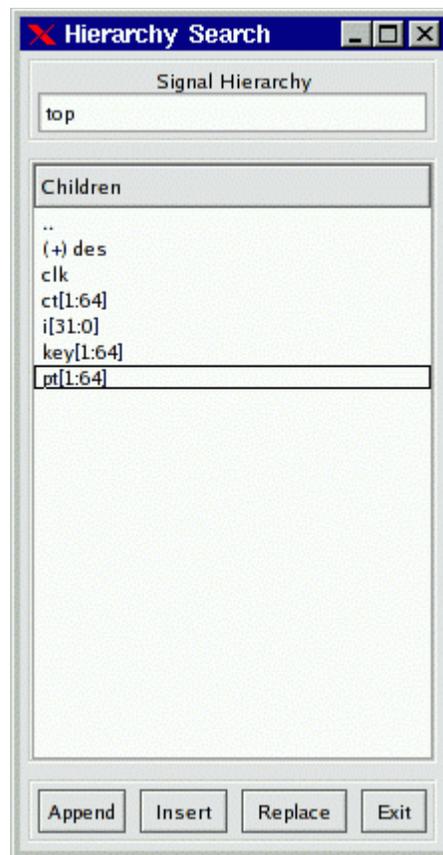


Figure 20: The Hierarchy Search Requester

handy for finding a specific signal at a level of hierarchy that is very large (e.g., in a synthesized netlist).

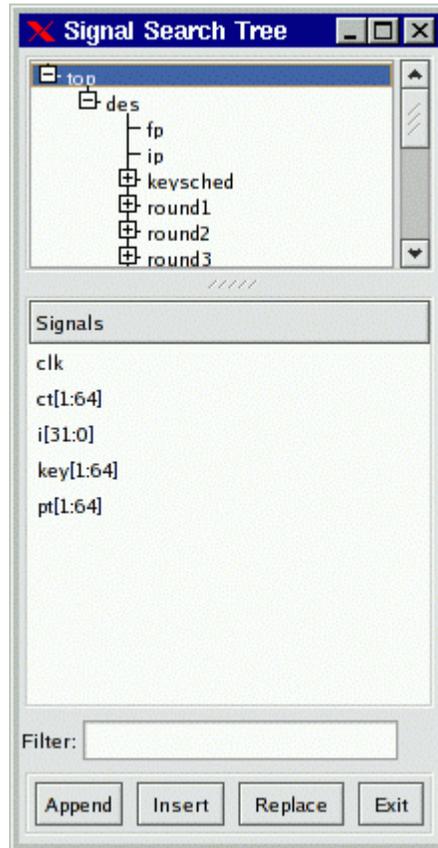


Figure 21: The Signal Search Tree Requester

Signal Save Files

The signals show in the main window can be saved to a file so they can automatically be imported without reselection the next time the viewer is started. In order to save signals to a save file, select the File submenu option Write Save File (As). Save files can also be loaded at any time by selecting the Read Save File option.

Pattern Search

Values, not only nets may be searched on and marked in the wave window. In order to do this, select one or more nets in the signal window and then click on the Search submenu option Pattern Search. A Pattern Search Requester will then appear that will allow various types of search operations for the signals that have been selected.

The following is an example of a Pattern Search Requester being used to mark the rising edges for the clock signal in a simulation model.

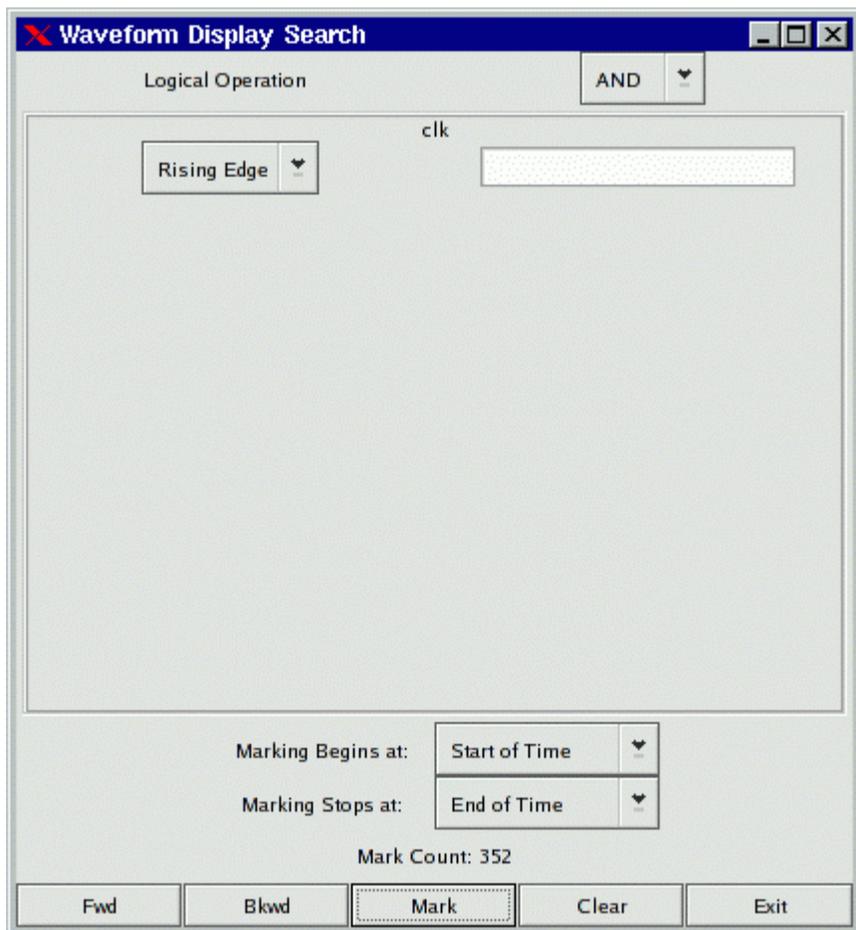


Figure 22: The Pattern Search Requester

The edges as they are marked by the configuration of the Requester in Figure 22 can be seen in Figure 2: The main window with an embedded SST on page 15.

To remove pattern marks, either select another pattern or select the View submenu option Remove Pattern Marks. Note that pattern marks save to the save file and that the actual pattern search criteria is saved, not the absolute times of the individual marks themselves.

Search criteria for individual nets can be edge or value based. For "String" searches (the entry box to the

right of the search type box which in the case above is marked "Rising Edge"), note that you must press Enter for the string in order to commit the value to the search.

Alias Files and Attaching External Disassemblers

The viewer supports signal aliasing through both plaintext filters and through external program filters. Note that signal aliasing is a strict one-to-one correspondence so the value represented in the viewer must exactly represent what format your filter expects. (e.g., binary, hexadecimal, with leading base markers, etc.) For your convenience, the comparisons are case insensitive.

For text filters, the viewer looks at an ASCII text file of the following format:

```
#
# this is a comment
#
00 Idle
01 Advance
10 Stop
11 Reset
```

The first non-whitespace item is treated as a literal value that would normally be printed by the viewer and the remaining items on the line are substitution text. Any time this text is encountered if the filter is active, it will replace the left-hand side text with the right-hand side. Leading and trailing whitespaces are removed from the right-hand side item.

To turn on the filter:

- 1) Highlight the signals you want filtered
- 2) Edit->Data Format->Translate Filter File->Enable and Select
- 3) Add Filter to List
- 4) Click on filter filename
- 5) Select filter filename from list
- 6) OK

To turn off the filter:

- 1) Highlight the signals you want unfiltered.
- 2) Edit->Data Format->Translate Filter File->Disable

NOTE: Filter configurations load and save properly to and from save files.

An external process that accepts one line in from stdin and returns with data on stdout can be used as a process filter. An example of this are disassemblers. The following sample code would show how to interface with a disassembler function in C:

```
int main(int argc, char **argv)
{
while(1)
    {
    char buf[1025], buf2[1025];

    buf[0] = 0;
    fscanf(stdin, "%s", buf);
    if(buf[0])
        {
        int hx;
        sscanf(buf, "%x", &hx);
```

```
        ppc_dasm_one(buf2, 0, hx);
        printf("%s\n", buf2);
        fflush(stdout);
    }

    return(0);
}
```

Note that the `fflush(stdout)` is necessary, otherwise *gtkwave* will hang. Also note that every line of input needs to generate a line of output or the viewer will hang too.

To turn on the filter:

- 1) Highlight the signals you want filtered
- 2) Edit->Data Format->Translate Filter Process->Enable and Select
- 3) Add Proc Filter to List
- 4) Click on filter filename
- 5) Select filter filename from list
- 6) OK

To turn off the filter:

- 1) Highlight the signals you want unfiltered.
- 2) Edit->Data Format->Translate Filter Process->Disable

Debugging the Source Code

See the description for RTLBrowse on page 21. More features are planned to be added in future releases.

- i,--indirect <filename>
Specify indirect facts file name. The file contains a series of regular expressions used to limit what signals can be browsed. Signal names which match any of the regular expressions will be viewable. Typically, indirect files are used to reduce memory requirements for extremely large models containing millions of facilities or to strip out top-level hierarchy clutter from BugSpray models. This feature is only available with the AET2 loader.
- l,--logfile <filename>
Specify simulation logfile name. Multiple logfiles may be specified by preceding each with the command flag. By selecting the numbers in the text widget, the marker will immediately zoom to the specific time value.
- d,--defaultskip
If there is not a .gtkwaverc file in the home directory or current directory and it is not explicitly specified on the command line, when this option is enabled, do not use an implicit configuration file and instead default to the old "whitescreen" behavior.
- s,--start <time>
Specify start time for LXT2/VZT block skip.
- e,--end <time>
Specify end time for LXT2/VZT block skip.
- t,--stems <filename>
Specify stems file for source code annotation. This will automatically launch the rtlbrowse(1) helper process. See vertex(1) for information on stems file generation.
- c,--cpu <numcpus>
Specify number of CPUs available for parallelizable ops (e.g., block prefetching on VZT reads).
- v,--vcd
Use stdin as a VCD dumpfile.
- V,--version
Display version banner then exit.
- h,--help
Display help then exit.
- x,--exit
Exit after loading trace (for loader benchmarking).

FILES

~/.gtkwaverc

EXAMPLES

To run this program the standard way type:
gtkwave dumpfile.vcd

Alternatively you can run it with a save file as:
gtkwave dumpfile.vcd dumpfile.sav

Command line options are not necessary for representing the dumpfile, savefile, and rcfile names. They are merely provided to allow specifying them out of order. Note that on non-glibc systems, the long command line options will not be available and that the short ones will have to be used instead.

BUGS

AIX requires `-bmaxdata:0x80000000` to be added to your list of compiler flags for `xlc` if you want GTKWave to be able to access more than 256MB of virtual memory. The value shown allows the VMM to use up to 2GB. This may be necessary for very large traces.

Shift and Page operations using the wave window hscrollbar may be non-functional as you move away from the dump start for very large traces. A trace that goes out to 45 billion ticks has been known to exhibit this problem. This stems from using the `gfloat` element of the horizontal slider to encode the time value for the left margin. The result is a loss of precision for very large values. Use the hotkeys or buttons at the top of the screen if this is a problem.

When running under Cygwin, it is required to enable Cygserver if shared memory IPC is being used. Specifically, this occurs when `rtlbrowse(1)` is launched as a helper process. See the Cygwin documentation for more information on how to enable Cygserver.

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SEE ALSO

`gtkwaverc(5)` `lxt2vcd(1)` `vcd2lxt(1)` `vcd2lxt2(1)` `vzt2vcd(1)` `vcd2vzt(1)`
`vertex(1)` `rtlbrowse(1)`

Anthony Bybell

3.0.2

GTKWAVE(1)

lxt2miner

LXT2MINER(1)

Dumpfile Data Mining

LXT2MINER(1)

NAME

`lxt2miner` - Data mining of LXT2 files

SYNTAX

`lxt2miner` [option]... [LXT2FILE]

mvl2vcd

MVL2VCD(1) Filetype Conversion MVL2VCD(1)

NAME
mvl2vcd - Coverts MVLSIM AET files to VCD

SYNTAX
mvl2vcd <filename.aet>

DESCRIPTION
Converts AET files to VCD on stdout. This is experimental as it is not a complete implementation and is not intended for general use.

AUTHORS
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SEE ALSO
tex2vcd(1) mvl2lxt(1) lxt2vcd(1) vcd2lxt2(1) vcd2lxt(1) gtkwave(1)

Anthony Bybell 1.3.34 MVL2VCD(1)

rtlbrowse

RTLBROWSE(1) File Viewing RTLBROWSE(1)

NAME
rtlbrowse - Allows hierarchical browsing of Verilog HDL sourcecode and library design files.

SYNTAX
rtlbrowse <stemsfilename>

DESCRIPTION
Allows hierarchical browsing of Verilog HDL sourcecode and library design files. Navigation through the hierarchy may be done by clicking open areas of the tree widget and clicking on the individual levels of hierarchy. Inside the sourcecode, selecting the module instantiation name by double clicking or selecting part of the name through drag-clicking will descend deeper into the RTL hierarchy. Note that it performs optional source code annotation when called as a helper application by `gtkwave(1)` and when the primary marker is set. Source code annotation is not available for all supported dumpfile types. It is

SYNTAX

vcd2lxt [VCDFILE] [LXTFILE] [option]...

DESCRIPTION

Converts VCD files to interlaced or linear LXT files. Noncompressed interlaced files will provide the fastest access, linear files will provide the slowest yet have the greatest compression ratios.

OPTIONS

-stats Prints out statistics on all nets in VCD file in addition to performing the conversion.

-clockpack

Apply two-way subtraction algorithm in order to identify nets whose value changes by a constant XOR or whose value increases/decreases by a constant amount per constant unit of time. This option can reduce dumpfile size dramatically as value changes can be represented by an equation rather than explicitly as a triple of time, net, and value.

-chgpak

Emit data to file after being filtered through zlib (gzip).

-linear

Write out LXT in "linear" format with no backpointers. These are re-generated during initialization in gtkwave. Additionally, use libbz2 (bzip2) as the compression filter.

-dictpack <size>

Store value changes greater than or equal to size bits as an index into a dictionary. Experimentation shows that a value of 18 is optimal for most cases.

EXAMPLES

Note that you should specify dumpfile.vcd directly or use "-" for stdin.

```
vcd2lxt dumpfile.vcd dumpfile.lxt -clockpack -chgpak -dictpack 18
```

This turns on clock packing, zlib compression, and enables the dictionary encoding. Note that using no options writes out a normal LXT file.

```
vcd2lxt dumpfile.vcd dumpfile.lxt -clockpack -linear -dictpack 18
```

Uses linear mode for even smaller files.

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vcd2lxt2

NAME

vcd2lxt2 - Converts VCD files to LXT2 files

SYNTAX

vcd2lxt2 [option]... [VCDFILE] [LXTFILE]

DESCRIPTION

Converts VCD files to LXT2 files.

OPTIONS

- v, --vcdname <filename>
Specify VCD input filename.
- l, --lxtname <filename>
Specify LXT2 output filename.
- d, --depth <value>
Specify 0..9 gzip compression depth, default is 4.
- m, --maxgranule <value>
Specify number of granules per section, default is 8. One granule is equal to 32 timesteps.
- b, --break <value>
Specify break size (default = 0 = off). When the break size is exceeded, the LXT2 dumper will dump all state information at the next convenient granule plus dictionary boundary.
- p, --partialmode <mode>
Specify partial zip mode 0 = monolithic, 1 = separation. Using a value of 1 expands LXT2 filesize but provides fast access for very large traces. Note that the default mode is neither monolithic nor separation: partial zip is disabled.
- c, --checkpoint <mode>
Specify checkpoint mode. 0 is on which is default, and 1 is off. This is disabled when the break size is active.
- h, --help
Show help screen.

EXAMPLES

Note that you should specify `dumpfile.vcd` directly or use `"-"` for stdin.

```
vcd2lxt dumpfile.vcd dumpfile.lxt --depth 9 --break 1073741824  
This sets the compression level to 9 and sets the break size to 1GB.
```

```
vcd2lxt dumpfile.vcd dumpfile.lxt --depth 9 --maxgranule 256  
Allows more granules per section which allows for greater compression.
```

LIMITATIONS

vcd2lxt2 does not store glitches as these are coalesced together into one value change during the writing of the LXT2 file.

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SEE ALSO

lxt2vcd(1) vcd2lxt2(1) gtkwave(1)

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1.3.42

VCD2LXT2(1)

vcd2vzt

VCD2VZT(1)

Filetype Conversion

VCD2VZT(1)

NAME

vcd2vzt - Converts VCD files to VZT files

SYNTAX

vcd2vzt [option]... [VCDFILE] [VZTFILE]

DESCRIPTION

Converts VCD files to VZT files.

OPTIONS

- v, --vcdname <filename>
Specify VCD input filename.
- l, --vztname <filename>
Specify VZT output filename.
- d, --depth <value>
Specify 0..9 gzip compression depth, default is 4.
- m, --maxgranule <value>
Specify number of granules per section, default is 8. One granule is equal to 32 timesteps.
- b, --break <value>
Specify break size (default = 0 = off). When the break size is exceeded, the VZT dumper will dump all state information at the next convenient granule plus dictionary boundary.
- z, --ziptype <value>
Specify zip type (default = 0 gzip, 1 = bzip2). This allows you to override the default compression algorithm to use a more effective one at the expense of greater runtime. Note that bzip2 does not decompress as fast as gzip so the viewer will be

about two times slower when decompressing blocks.

-t, --twostate

Forces MVL2 twostate mode (default is MVL4). When enabled, the trace will only store 0/1 values for binary facilities. This is useful for functional simulation and will speed up dumping as well as make traces somewhat smaller.

-r, --rle

Uses an bitwise RLE compression on the value table. Default is off. When enabled, this causes the trace data table to be stored using an alternate representation which can improve compression in many cases.

-h, --help

Show help screen.

EXAMPLES

Note that you should specify `dumpfile.vcd` directly or use `"-"` for `stdin`.

```
vcd2vzt dumpfile.vcd dumpfile.lxt --depth 9 --break 1073741824
    This sets the compression level to 9 and sets the break size to 1GB.
```

```
vcd2vzt dumpfile.vcd dumpfile.lxt --depth 9 --maxgranule 512
    Allows more granules per section which allows for greater compression at the expense of memory usage.
```

LIMITATIONS

`vcd2vzt` does not store glitches as these are coalesced together into one value change during the writing of the VZT file.

AUTHORS

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SEE ALSO

`vzt2vcd(1)` `lxt2vcd(1)` `vcd2lxt2(1)` `gtkwave(1)`

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1.3.48

VCD2VZT(1)

vertex

VERTEX(1)

Verilog Compilation

VERTEX(1)

NAME

`vertex` - Parses and processes Verilog HDL files

SYNTAX

vertex [VERILOGFILE]... [option]...

DESCRIPTION

Parses Verilog HDL files for use by other tools. The Verilog grammar used is 1364-1995.

OPTIONS

-h[elp]
Prints out help screen.

-emitmono fname
Emit monolithic (parser view of) file to fname.

-emitstems
Emit source code stems to stdout.

-emitvars
Emit source code variables to stdout.

-Dx=y Equivalent to `define X Y in source.

+define+x=y
Equivalent to `define X Y in source.

+incdir+dirname
Add dirname to include search path.

+libext+ext
Add ext to filename when searching for files.

-pragma name
Add name (synopsys, verilint, vertex) to accepted pragmas.

-y dirname
Add directory dirname to source input path.

-yi dirname
Add directory dirname to source input path (case insensitive search).

EXAMPLES

The following indicates that the library extension is .v and that the include directory is the current working directory and that the library directory is also the current working directory. Stems generation is enabled to generate a stems file for use with other tools. Various compile-time defines are also defined on the command line.

```
vertex XYZ450AC6V1.v -emitstems -y . +incdir+. +libext+.v -DUTLB_Out-  
putData=0 -D__PORTALS_VERILOG__
```

AUTHORS

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SEE ALSO

rtlbrowse(1) gtkwave(1)

DESCRIPTION

Mines VZT files for specific data values and generates gtkwave save files to stdout for future reload.

OPTIONS

- d,--dumpfile <filename>
Specify VZT input dumpfile.
- m,--match <filename>
Specifies "bitwise" match data (binary, real, string)
- x,--hex <value>
Specifies hexadecimal match data that will automatically be converted to binary for searches
- n,--namesonly
Indicates that only facnames should be printed in a gtkwave savefile compatible format. By doing this, the file can be used to specify which traces are to be imported into gtkwave.
- h,--help
Show help screen.

EXAMPLES

```
vztminer dumpfile.vzt --match 20470000 -n
```

This attempts to match the hex value 20470000 across all facilities and when the value is encountered, the facname only is printed to stdout in order to generate a gtkwave compatible save file.

LIMITATIONS

vztminer only prints the first time a value is encountered for a specific net. This is done in order to cut down on the size of output files and to aid in following data such as addresses through a simulation model.

AUTHORS

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SEE ALSO

lxt2miner(1) vzt2vcd(1) lxt2vcd(1) vcd2lxt2(1) gtkwave(1)

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1.3.64

VZTMINER(1)

Appendix B: .gtkwaverc Variable Reference

A difference in Windows to be aware of is that the default (if unspecified) *.gtkwaverc* file is known as *gtkwave.ini* and resides in the current working directory.

GTKWAVERC(5) GTKWave Configuration File GTKWAVERC(5)

NAME
 gtkwaverc - GTKWave Configuration File

SYNTAX
 option <value>

The configuration file is a series of option and value pairs. Comment lines marked with an initial '#' character are permissible. Blank lines are ignored.

DESCRIPTION
 Configuration file for gtwave(1). The search path for the configuration file (if unspecified) is the current working directory followed by the user's home directory.

OPTIONS
 alt_hier_delimiter <value>
 This allows another character in addition to the hier_delimiter to be used to delimit levels in the hierarchy for VCD. Only the first character in the value is significant. Note that this is normally off. The intended use is to resolve the hierarchies of netlist based models that often contain slashes to delimit hierarchy inside of \$var statements.

 append_vcd_hier <value>
 Allows the specification of a prefix hierarchy for VCD files. This can be done in "pieces," so that multiple layers of hierarchy are prepended to symbol names with the most significant addition occurring first (see *.gtkwaverc* in the examples/vcd directory). The intended use of this is to have the ability to

add "project" prefixes which allow easier selection of everything from the tree hierarchy.

atomic_vectors <value>

Speeds up vcd loading and takes up less memory. The downside is that atomic vectors are treated internally as a single bit and can't be coalesced into larger vectors or split up. Because of this single bit nature, the bundle down and bundle up operations when used in Signal Search Regexp, Signal Search Hierarchy, and Signal Search Tree will perform seemingly unpredictably.

autocoalesce <value>

A nonzero value enables autocoalescing of VCD vectors when applicable. This may be toggled dynamically during wave viewer usage.

autocoalesce_reversal <value>

causes split vectors to be reconstructed in reverse order (only if autocoalesce is also active).

autoname_bundles <value>

A nonzero value indicates that GTKWave will create its own bundle names rather than prompting the user for them.

color_0 <value>

trace color when 0.

color_1 <value>

trace color when 1.

color_back <value>

background color.

color_baseline <value>

middle mouse button marker color.

color_black <value>

color value for "black" in signal window.

color_dash <value>

trace color when don't care ("-").

color_dashfill <value>

trace color (inside of box) when don't care ("-").

color_dkblue <value>

color value for "dark blue" in signal window.

color_dkgray <value>

color value for "dark gray" in signal window.

color_grid <value>

grid color (use Alt-G/Shift-Alt-G to show/hide grid).

color_high <value>

trace color when high ("H").

color_low <value>
trace color when low ("L").

color_ltgray <value>
color value for "light gray" in signal window.

color_mark <value>
color of the named markers.

color_mdgray <value>
color value for "medium gray" in signal window.

color_mid <value>
trace color when floating ("Z").

color_normal <value>
color value for "normal" GTK state in signal window.

color_time <value>
text color for timebar.

color_timeb <value>
text color for timebar's background.

color_trans <value>
trace color when transitioning.

color_u <value>
trace color when undefined ("U").

color_ufill <value>
trace color (inside of box) when undefined ("U").

color_umark <value>
color of the unnamed (primary) marker.

color_value <value>
text color for vector values.

color_vbox <value>
vector color (horizontal).

color_vtrans <value>
vector color (verticals/transitions).

color_w <value>
trace color when weak ("W").

color_wfill <value>
trace color (inside of box) when weak ("W").

color_white <value>
color value for "white" in signal window.

`color_x <value>`
trace color when undefined ("X") (collision for VHDL).

`color_xfill <value>`
trace color (inside of box) when undefined ("X") (collision for VHDL).

`constant_marker_update <value>`
A nonzero value indicates that the values for traces listed in the signal window are to be updated constantly when the left mouse button is being held down rather than only when it is first pressed then when released (which is the default).

`convert_to_reals <value>`
Converts all integer and parameter VCD declarations to real-valued ones when set to a nonzero/yes value. The positive aspect of this is that integers and parameters will take up less space in memory and will automatically display in decimal format. The negative aspect of this is that integers and parameters will only be displayable as decimals and can't be bit reversed, inverted, etc.

`cursor_snap <value>`
A nonzero value indicates the number of pixels the marker should snap to for the nearest signal transition.

`disable_tooltips <value>`
A nonzero value indicates that tooltip pop up bubbles should be disabled. A zero value indicates that tooltips should be active (default).

`do_initial_zoom_fit <value>`
A nonzero value indicates that the trace should initially be crunched to fit the screen. A zero value indicates that the initial zoom should be zero (default).

`dynamic_resizing <value>`
A nonzero value indicates that dynamic resizing should be initially enabled (default). A zero value indicates that dynamic resizing should be initially disabled.

`enable_fast_exit <value>`
Allows exit without bringing up a confirmation requester.

`enable_ghost_marker <value>`
lets the user turn on/off the ghost marker during primary marker dragging. Default is enabled.

`enable_horiz_grid <value>`
A nonzero value indicates that when grid drawing is enabled, horizontal lines are to be drawn. This is the default.

`enable_vcd_autosave <value>`
causes the vcd loader to automatically generate a .sav file

(vcd_autosave.sav) in the cwd if a save file is not specified on the command line. Note that this mirrors the VCD \$var defs and no attempt is made to coalesce split bitvectors back together.

enable_vert_grid <value>

A nonzero value indicates that when grid drawing is enabled, vertical lines are to be drawn. This is the default. Note that all possible combinations of enable_horiz_grid and enable_vert_grid values are acceptable.

fontname_logfile <value>

When followed by an argument, this indicates the name of the X11 font that you wish to use for the logfile browser. You may generate appropriate fontnames using the xfontsel program.

fontname_signals <value>

When followed by an argument, this indicates the name of the X11 font that you wish to use for signals. You may generate appropriate fontnames using the xfontsel program.

fontname_waves <value>

When followed by an argument, this indicates the name of the X11 font that you wish to use for waves. You may generate appropriate fontnames using the xfontsel program. Note that the signal font must be taller than the wave font or the viewer will complain then terminate.

force_toolbars <value>

When enabled, this forces everything above the signal and wave windows to be rendered as toolbars. This allows for them to be detached which allows for more usable wave viewer space. By default this is off.

hide_sst <value>

Hides the Signal Search Tree widget for GTK2.4 and greater such that it is not embedded into the main viewer window. It is still reachable as an external widget through the menus.

hier_delimiter <value>

This allows characters other than '/' to be used to delimit levels in the hierarchy. Only the first character in the value is significant.

hier_grouping <value>

For the tree widgets, this allows the hierarchies to be grouped in a single place rather than spread among the netnames.

hier_max_level <value>

Sets the maximum hierarchy depth (from the right side) to display for trace names. Note that a value of zero displays the full hierarchy name.

hpane_pack <value>

A nonzero value indicates that the horizontal pane should be

constructed using the `gtk_paned_pack` functions (default and recommended). A zero value indicates that `gtk_paned_add` will be used instead.

`initial_window_x <value>`
Sets the size of the initial width of the wave viewer window. Values less than or equal to zero will set the initial width equal to -1 which will let GTK determine the minimum size.

`initial_window_xpos <value>`
Sets the size of the initial x coordinate of the wave viewer window. -1 which will let the window manager determine the position.

`initial_window_y <value>`
Sets the size of the initial height of the wave viewer window. Values less than or equal to zero will set the initial width equal to -1 which will let GTK determine the minimum size.

`initial_window_ypos <value>`
Sets the size of the initial y coordinate of the wave viewer window. -1 which will let the window manager determine the position.

`left_justify_sigs <value>`
When nonzero, indicates that the signal window signal name justification should default to left, else the justification is to the right (default).

`lxt_clock_compress_to_z <value>`
For LXT (not LXT2) allows clocks to compress to a 'z' value so that regular/periodic value changes may be noted.

`page_divisor <value>`
Sets the scroll amount for page left and right operations. (The buttons, not the hscrollbar.) Values over 1.0 are taken as 1/x and values equal to and less than 1.0 are taken literally. (i.e., 2 gives a half-page scroll and .67 gives 2/3). The default is 1.0.

`ps_maxveclen <value>`
sets the maximum number of characters that can be printed for a value in the signal window portion of a postscript file (not including the net name itself). Legal values are 4 through 66 (default).

`show_base_symbols <value>`
A nonzero value (default) indicates that the numeric base symbols for hexadecimal ('\$'), binary ('%'), and octal ('#') should be rendered. Otherwise they will be omitted.

`show_grid <value>`
A nonzero value (default) indicates that a grid should be drawn behind the traces. A zero indicates that no grid should be drawn.

`splash_disable <value>`
Turning this off enables the splash screen with the GTKWave mascot when loading a trace. Default is on.

`sst_expanded <value>`
When true allows the SST dialog (when not hidden) to come up already expanded.

`use_big_fonts <value>`
A nonzero value indicates that any text rendered into the wave window will use fonts that are four points larger in size than normal. This can enhance readability. A zero value indicates that normal font sizes should be used.

`use_full_precision <value>`
does not round time values when the number of ticks per pixel onscreen is greater than 10 when active. The default is that this feature is disabled.

`use_maxtime_display <value>`
A nonzero value indicates that the maximum time will be displayed in the upper right corner of the screen. Otherwise, the current primary (unnamed) marker time will be displayed. This can be toggled at any time with the Toggle Max-Marker menu option.

`use_nonprop_fonts <value>`
Allows accelerated redraws of the signalwindow that can be done because the font width is constant. Default is off.

`use_roundcaps <value>`
A nonzero value indicates that vector traces should be drawn with rounded caps rather than perpendicular ones. The default for this is zero.

`use_scrollbar_only <value>`
A nonzero value indicates that the page, shift, fetch, and discard buttons should not be drawn (i.e., time manipulations should be through the scrollbar only rather than front panel buttons). The default for this is zero.

`vcd_explicit_zero_subscripts <value>`
indicates that signal names should be stored internally as `name.bitnumber` when enabled. When disabled, a more "normal" ordering of `name[bitnumber]` is used. Note that when disabled, the Bundle Up and Bundle Down options are disabled in the Signal Search Regexp, Signal Search Hierarchy, and Signal Search Tree options. This is necessary as the internal data structures for signals are represented with one "less" level of hierarchy than when enabled and those functions would not work properly. This should not be an issue if `atomic_vectors` are enabled. Default for `vcd_explicit_zero_subscripts` is disabled.

`vcd_preserve_glitches <value>`

indicates that any repeat equal values for a net spanning different time values in the vcd file are not to be compressed into a single value change but should remain in order to allow glitches to be present for this case. Default for vcd_preserve_glitches is disabled.

vcd_warning_filesize <value>

produces a warning message if the VCD filesize is greater than the argument's size in MB. Set to zero to disable this.

vector_padding <value>

indicates the number of pixels of extra whitespace that should be added to any strings for the purpose of calculating text in vectors. Permissible values are 0 to 16 with the default being 4.

wave_scrolling <value>

a nonzero value enables scrolling by dragging the marker off the left or right sides of the wave window. A zero value disables it.

zoom_base <value>

allows setting of the zoom base with a value between 1.5 and 10.0. Default is 2.0.

zoom_center <value>

a nonzero value enables center zooming, a zero value disables it.

zoom_pow10_snap <value>

corresponds to the Zoom Pow10 Snap menu option. Default for this is disabled (zero).

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SEE ALSO

gtkwave(1)

Anthony Bybell

3.0.0

GTKWAVERC(5)

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