

SharkSim Editor and Viewer User Guide

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Inside This Manual

Overview

This document describes the main editing and viewing functions of the SharkSim application. SharkSim is a modeling and simulation software application for digital designs. It allows users to load and view different simulation models and provides full support for generating, validating, and correlating IBIS simulation models.

SharkSim Documentation

The SharkSim application documentation is divided into separate User Guides as listed below.

SharkSim Editor and Viewer Guide. Describes how to load and view IBIS simulation models as well as general application features.

SharkSim Quality Checker Guide. Describes how to use the Quality Checker feature to validate IBIS simulation models.

SharkSim SPICE to IBIS Guide. Describes how to translate SPICE to IBIS simulation models using the built-in translation GUI features and also how to build a full IBIS file.

SharkSim IBIS Simulation and Correlation Guide. Describes how to simulate IBIS buffer models and view the results. Also describes how to use existing [Test Data] to perform full correlation.

Customer Support

Customers can view the HTML help file any time from within the application by selecting the **Help** icon. The user guides are also in PDF format in the application release directory.

Customers can also visit www.sharksim.com to get full support for the application through additional tutorials, white papers, videos, forums, and contact information of the SharkSim developers.

Naming Conventions

Many different naming conventions are used when talking about the IBIS Specification. For all of the SharkSim User Guides the following conventions have been followed:

IBIS File. This refers to the overall IBIS file with a .ibs extension.

IBIS Buffer Model. This refers to the individual keyword [Model] types in the overall IBIS file. The buffer models as listed by the [Model] keyword are the actual sections where the IBIS data is stored for each [Model] type.

IBIS keywords [keyword]. The IBIS Specification specifies special keywords using the format [keyword] and the User Guides use the same format to highlight the fact that a keyword is being used.

Many engineers interchange ‘IBIS File’ and ‘IBIS Model’. Sometimes an engineer will be talking about the full IBIS file with .ibs extension yet will call it an IBIS model. The SharkSim User Guides have tried to distinguish between IBIS File and IBIS Buffer Model to make the terminology easier to understand.

Preferences and Licensing

Overview

SharkSim has a Preferences GUI window to set some application wide preferences as well as a simple Licensing GUI window to verify and update the application license.

Preferences

The Preferences GUI window can be opened from the navigation menu item **View | Preferences**. The following application preferences can be set:

Author: The author name is used in the Notes Manager.

Directory of IBIS Keyword File: The keyword file is part of the application release and is in the release directory. The user needs to point to this directory in order for the editor to work properly. There is a different keyword file for each version of the IBIS Specification. The application will use the default IBIS version as set in the Default IBIS version field. To properly view and edit an IBIS file with a different IBIS version the user needs to go to **File | Change Version** and enter the correct IBIS version. **Note:** if this is the first time using the application the user must set the path to this directory and exit and restart the application only once for the changes to take place.

Default IBIS Version: The default IBIS version for viewing IBIS models.

IBIS Syntax Checker Application path: The IBIS Syntax Checker or IBIS Parser executable must be downloaded from the IBIS Group website and the user must set the path to this executable in order for the application to work properly.

Default Working Directory: The user needs to set the path to the working directory in order for the application to properly generate and simulate files.

Path to SPICE application: In order for the SharkSim application to integrate with external SPICE applications the user must set the path to the SPICE

executable. This path must be set for the SPICE to IBIS Translation and IBIS Model Simulation features to work properly.

SPICE Application: The default SPICE application is HSPICE but the user can select from the other options in the drop down list.

SPICE Options: The user can enter global SPICE run options to be used in the SPICE to IBIS Translation netlists.

Editor Font Size: The default font size of the IBIS data displayed in the main editor window can be changed.

Curve Points Processing: The default curve point processing is to use linear equal spacing. The best fit algorithm is still in Beta and may or may not work depending on the user design.

Licensing

The Licensing window can be opened from the navigation menu item **View | License**.

For Legacy license management the Application ID is shown and the user can enter in the License key. In order for a license key to be generated the user must send the Application ID to SharkSim support.

For new license management including floating LAN support the license GUI can be used to specify the location of the node locked license file or the license server host name and port.

Using the Navigation Menu/Toolbar

Overview

Different features of the SharkSim application can be accessed using the menu items as well as the toolbar icons.

Navigation Menu Items

Different features of the SharkSim application can be accessed using the menu items. The available menu items are listed below:

File | New: Create a new IBIS file.

File | Open: Open an IBIS file.

File | Close: Close an IBIS file.

File | Save: Save the current IBIS file.

File | Save As: Save the current IBIS file with an .ibs extension.

File | Change Version: Set the IBIS version of IBIS file to be edited.

File | Print: Print IBIS file data.

Edit | Cut: Cut the IBIS data.

Edit | Copy: Copy the IBIS data.

Edit | Paste: Paste the IBIS data.

Edit | Undo: Undo the last edit.

Edit | Redo: Redo the last edit.

Edit | Find/Replace: Find and replace data in the IBIS file.

Edit | Go to Line: Go to the line number entered in the editor window.

Edit | Tabs to Spaces: Converts tabs to spaces in IBIS file.

Edit | Add Parser Results: IBIS Parser results added to Notes section.

Edit | Manage Notes: Launches Notes Manager that is used to manage the [Notes] section in an IBIS file.

Edit | IBIS Quick Editor: Launches the Quick Editor that provides overview of important IBIS data and a quick and easy way to edit model data.

View | Show Line Numbers: Turn on/off the line numbers in the main editing window.

View | Preferences: Open the Preferences settings window.

View | License: Opens the Licensing setting window.

Generate | Create Buffer Model: Allows the user to create a buffer model for the IBIS file.

Generate | Generate IBIS File: Allows the user to create a full IBIS file.

Generate | SPICE to IBIS Translation: Launches the SPICE to IBIS Translation GUI.

Validate | Check Syntax (IBIS Golden Parser): Runs the Golden Parser.

Validate | Model Quality Checks: Launches the Quality Checker.

Validate | Graph Data: Launches the Model Data Viewer for graphing buffer model data sets.

Validate | Package Editor: Launches Package Editor to edit package pin list in IBIS file.

Correlate | IBIS Model Simulation: Launches IBIS Model Simulation GUI to simulate buffer models into defined test loads.

Reports | Generate Custom IBIS Report: Launches Advanced Reporter GUI to create custom quality and reliability report of IBIS file.

Reports | Generate IBIS Quality Checklist Report: Launches IBIS Quality Checklist Report GUI to create IBIS Quality Specification 2.0 compliant report.

Help: Launches HTML help file.

Navigation Menu Icons

Different features of the SharkSim application can be accessed using the menu icons listed below:



File | New: Create a new IBIS file.



File | Open: Open an IBIS file.



File | Save: Save the current IBIS file.



Edit | Copy: Copy the IBIS data.



Edit | Undo: Undo the last edit.



Validate | Check Syntax (IBIS Golden Parser): Runs the Golden Parser.



Validate | Model Quality Checks: Launches the Quality Checker.



Validate | Graph Data: Launches the Model Data Viewer for graphing buffer model data sets.



File | Print: Print IBIS file data.



Help: Launches HTML help file.

Editing IBIS Files

Opening IBIS Files

An IBIS file can be opened from the application menu using **File | Open** or by using the hotkey combination Ctrl+O. SharkSim automatically looks for IBIS file types using the .ibs extension. Note that sometimes when an IBIS file is downloaded from the web it may have an improper extension so the best thing to do is to rename the IBIS file with the proper .ibs extension. Using the Save As command will automatically do this for you.

Saving IBIS Files

An IBIS file can be saved by using the application menu item **File | Save** or by using the hotkey combination Ctrl+S. If you do a **Save As** SharkSim will automatically save the IBIS file with the proper .ibs extension. SharkSim will also automatically update the [File name] keyword in the IBIS file to the filename used in the Save As dialog box. It is required by the IBIS Specification that the [File name] keyword match the actual filename of the IBIS file. SharkSim helps you avoid this common error by automatically updating the keyword for you.

Viewing IBIS Files

The data in an IBIS file is unencrypted ASCII text and SharkSim displays all of the IBIS data in the main window. In order to make viewing the IBIS data easier, the lines that are commented using the special comment character | are **green** and the keywords from the IBIS Specification are in **blue**. The line numbers are also shown on the left hand side of the main window. These can be turned off by going to **View | Show line numbers**. It is recommended to keep the line number display on (the default) as it is helpful when trying to debug errors in the IBIS file. In the bottom right hand corner of the application the current Line Number is also displayed. SharkSim uses the default IBIS version in the Preferences GUI to apply the correct keyword editing to the opened IBIS file but the user can change this at any time by going to **File | Change Version** to map to the correct IBIS version.

Editing Functions

SharkSim supports a standard set of text editing functions that can be accessed from the navigation menu item **Edit** as well as right clicking the mouse in the main window.

Using the Tree Navigation

All of the IBIS keywords and sub-keywords are categorized in the tree menu in the left hand pane. This is a useful and quick way of moving around in an IBIS file. By left clicking once on any of the keyword items in the tree menu the keyword in the main window is highlighted and brought into view if the keyword is not already visible in the main window.

Keywords that have sub-keywords will have the plus sign + visible. By clicking on the plus sign + the sub-keywords will be shown in an expanded view and the sub-keywords can be clicked on like the normal keywords. You can also double click on the main keyword to expand the sub-keyword view as well.

Notes Manager

Overview

The IBIS Specification provides the [Notes] keyword to place any notes about the data in the IBIS file in an easy to access place in the IBIS file. IBIS model developers often use the Notes section to list any known issues with the IBIS file. IBIS model users often use the Notes section to keep track of revision changes.

However, having to manually add notes in this manner often times by multiple engineers leads to quality control issues and an unstructured format. SharkSim has a special Notes Manager that allows the user to keep track of all notes in the IBIS file.

Using the Notes Manager

The Notes Manager can be invoked from the menu item **Edit | Notes Manager** or by using the hotkey F12. The Notes Manager displays five fields: the Note ID which is used to keep track of the notes, the actual Note text, the Date, the Author, and the File Revision of the IBIS file. All of the notes are stored in the Notes section of the IBIS file with special SharkSim application keywords so they will not cause any parser errors. The notes should not be changed manually in the IBIS file but rather the Notes Manager should be used to do all editing of the notes.

The Notes Manager does not recognize existing text in the Notes section. If you want pre-existing notes to be added to the Notes Manager it needs to be done manually through the Notes Manager.

Setting the Author Preference

The Notes Manager automatically populates the Author field for you. This can be set by going to the menu item **View | Preferences** and filling in the Author field.

Viewing a Note

When the Notes Manager GUI is opened the available notes will be listed. By clicking on any of the available data fields the whole row for the note will be

highlighted. Once a note field has been highlighted the full text of the note will be shown in the text box at the bottom of the Notes Manager GUI. The text box will expand with automatic scroll fields to accommodate a note with any number of lines in it. This allows the user to easily scroll through the notes in an IBIS file.

Editing an Existing Note

When a note is highlighted the user can select the **Edit** button and the Note Editor GUI will pop up allowing the user to modify the Date, Author, File Revision, and the Note text.

Adding a Note

The user can select the **New** button and the Note Editor GUI will pop up allowing the user to create a new note by adding the Date, Author, File Revision, and the Note text.

Deleting a Note

When a note is highlighted the user can select the **Delete** button and the entire Note and associated fields will be deleted from the Notes Manager and the Notes section of the IBIS file.

Changing the File Revision

Often times when adding notes to an IBIS file the IBIS File Revision will be changes as well to reflect actual changes to the data in the IBIS file. The Notes Manager automatically takes the current file version from the [File Rev] keyword in the IBIS file and puts it in the FileRev field. When adding a new note or editing a current one the user can change the FileRev keyword and it will be automatically updated in the IBIS file. The user will be asked if they want the File Revision to be updated when they select the **OK** button in the Notes Manager GUI window.

Saving Changes

To save any changes made to the Notes section in the Notes Manager select the **OK** button.

IBIS Parser

Overview

The standards committee that develops and releases the IBIS Specification also releases an executable application called the IBIS Parser (also called the IBIS Checker and Golden Parser). The IBIS Parser parses an IBIS file and reports any warnings or errors it finds in the IBIS file. The IBIS Parser checks for syntax errors as well as some basic data integrity checks. Parsing an IBIS file with the IBIS Parser is an important step in validating an IBIS file before using it for simulation and analysis.

Setting Up the IBIS Parser

The IBIS Parser is available to download for free from the IBIS Group website as an executable application for either Linux or Windows. In the SharkSim application, by going to the menu navigation item **Help | Resources | Download IBIS Parser**, a webpage will automatically be opened in your default web browser and you can download the IBIS Parser. (The IBIS Parser can be downloaded by going to www.eigroup.org/ibis/tools.htm)

Once the IBIS Parser has been downloaded, the path to the IBIS Parser needs to be set in the preference by going to the navigation menu item **View | Preferences** and using the **Browse** button to locate and select the IBIS Parser executable for the IBIS Syntax Checker Application field. (Currently the most up to date IBIS Parser executable is `ibischk4.exe`)

Running the IBIS Parser

The IBIS Parser can be run within SharkSim by using the navigation menu item **Validate | Check Syntax (IBIS Golden Parser)** or by using the hotkey F9. The IBIS Parser can also be run by using the green check button icon in the main toolbar.

Viewing the IBIS Parser Results

The results from the IBIS Parser will be automatically displayed in the bottom pane of the application. The version of the IBIS Parser is shown on the first line and the name and location of the IBIS file being parsed is shown on the second line.

The remaining lines show the messages from the IBIS Parser. Using the latest IBIS Parser version 4.2.2, there are three different types of messages displayed: Notes, Warnings, and Errors. Each type of message should be reviewed and referenced to the IBIS Specification to understand any problems with the IBIS file.

Finding IBIS Parser Issues

For some of the messages displayed by the IBIS Parser a line number is included. If a message that has a line number is double clicked that line in the IBIS file will be brought into view and highlighted in the main window. This is a useful debugging feature to find which data sets in an IBIS file are causing issues.

Adding IBIS Parser Results to IBIS File

The results of the IBIS Parser can be added to the IBIS File in the Notes section automatically in SharkSim by going to the navigation menu item **Edit | Add Parser Results**.

Package Editor

Overview

The package pinout of a component is defined in the [Pin] section of an IBIS file. For each pin, the signal name along with the associated model name in the IBIS file is listed. The pin parasitics (R_pin, L_pin, and C_pin) can also be listed here as well. The pin properties in the IBIS file should match the listed pin properties in the package pinout section of the component datasheet.

SharkSim has a built-in package editor that allows the user to easily edit the package pin section of an IBIS file and validate the IBIS package pinout against the datasheet package pinout using a specification file.

Opening the Package Editor

The Package Editor can be opened by going to the navigation menu item **Validate | Package Editor**. This will bring up the Package Editor GUI and will populate the IBIS pin list in a table in the left hand pane of the GUI window.

Viewing and Sorting the IBIS Pin List

The IBIS pin list can be sorted by any of the available headers in the table by left clicking the left mouse on the header names such as Pin. The sorting options are either smallest to largest or largest to smallest. By clicking on any data field in the table the entire pin row will be highlighted.

Selecting Different Package Components

By using the Component selector box at the bottom of the Package Editor GUI the user can select different available Components in the IBIS file and edit the different package pin lists.

Editing the IBIS Pin List

Any data field except for the `model_type` field can be double clicked and then the data can be changed by the user. The user must hit the enter key to update the value in the table in the Package Editor.

When a pin row is highlighted in the table the user can use the **Duplicate Row** and **Delete Row** buttons to either copy or delete an entire row of pin data.

When a section of data is highlighted in the table the user can use the **Copy Selection** and **Paste Selection** buttons to either copy or paste a section of pin data.

Using the Package Spec File

To validate the IBIS package pin list data the user can load a package specification file and then compare the pinout of the IBIS file to the pinout from the datasheet.

The package specification file should have a `.pkgspec` extension with the following format:

Pin_name	Signal_name	Model_type
1	ddr_input	input

Only spaces or tabs are allowed in the package specification file. Comment lines can be used with the `#` character and empty lines are allowed. The `Pin_name` field represents the pin name or number (such as 1 or A1) of the component. The `Signal_name` field represents the signal name of the pin. The `Model_type` represents the model type of the signal for the pin such as an input, output, or input/output. Since this field will be compared against the model type in the IBIS file the model type names should conform to the following format: Input, Output, Bidir, Power, and Ground. Package specification files can be easily created from most PCB layout tools as well as exported from Microsoft Excel files.

Validating the IBIS Pin List

The user can upload a package specification file by using the **Load Pkg Spec** button. The table in the right hand pane will be populated with the data from the

package specification file. To compare the IBIS pin list against the pin list from the specification file the user can select the **Check** button.

The Package Editor compares the Pin field and the Model_type field of the IBIS pin list against the package specification and reports any mismatches. The mismatches are highlighted in the table in the right hand pane. If the Pin field is highlighted it means that the Pin is missing from the IBIS pin list or it is a duplicate. If the Model_type field is highlighted it means that the Model_type in the IBIS pin list does not match the package specification.

A row of Pin data in the package specification table can be highlighted and then using the **Arrow button** can be added to the IBIS pin list section. The model_name and R/L/C pin data fields can then be filled in.

Saving Changes to the IBIS Pin List

In order to save any changes made to the IBIS pin list data in the Package Editor the user must select the **Save Pinlist button**. A popup dialog box will inform the user that the [Pin] data in the IBIS file has been modified.

IBIS Quick Editor

Overview

The IBIS Quick Editor is a powerful GUI based interactive editor that allows the user to easily see an overview of the IBIS file and the included models in the IBIS file. The Quick Editor is designed to be the first GUI window that the user opens when opening a new IBIS file to be able to quickly see the most used information and quickly make edits to the models in the IBIS file.

Opening the Quick Editor

The Quick Editor can be opened by going to the navigation menu item **Edit | IBIS Quick Editor**. The Quick Editor has two main information windows: the IBIS File Summary window in the left hand pane and the IBIS Model Summary window in the right hand pane.

IBIS File Summary

The IBIS File Summary window displays important IBIS data relating to the overall IBIS file such as the [IBIS Version], [Source], and so on. It is meant to provide a snapshot of the most important data in an IBIS file.

Editing Data in IBIS File Summary

Any of the data fields in the IBIS File Summary can be edited by selecting the **Edit** button. To apply the changes to the actual IBIS file the user must select the **Save** button. A popup dialog box will inform the user that changes have been made to the IBIS file.

Viewing and Editing Notes

By selecting the **View Notes** button the user can see all of the data in the [Notes] section of the IBIS file. The user can also access the **Notes Manager** directly from the Quick Editor as well.

Modifying the Component

In order to modify the Component name the user must use the text box below the Component chooser box.

Quality Level

The user can assign an overall quality level to the IBIS file by using the **Quality Level** data field. This is not part of the IBIS Specification and SharkSim will store this value in the [Notes] section with a special character code. The user can select the **View Levels** button to view the available quality level codes to choose from.

To view the quality level descriptions please see the IBIS Quality Specification 2.0 document as SharkSim uses these defined quality levels.

The goal of assigning a quality level to an IBIS file is to allow the user to be able to quickly identify any potential issues with the IBIS file for their particular system level simulations. All design projects are different and analysis is done at different stages so for some projects a lower quality level will be acceptable but with others it will not be.

Quality Report

If the model developer has created any additional information about the IBIS file a SharkSim specific field called **Quality Report** can be used to enter the URL of an HTML based report. This is not an IBIS Specification keyword so SharkSim will store the variable in the [Notes] section of the IBIS file with a special character code. The user can select the **Open Report** button and the default web browser will open with the Quality Report URL link.

Viewing and Editing the Package

The user can view and edit the Package [Pin] data in the IBIS file by accessing the Package Editor by selecting the **Package Editor** button.

Viewing IBIS Parser Results

If the IBIS Parser results were saved to the IBIS file using the SharkSim application then the user can select the **View Results** button and the IBIS Parser results will be shown in a readable GUI window.

IBIS Model Summary

The IBIS Model Summary window displays important data relating to the selected model in the IBIS file such as the Type of model and different parameters like Vinh and Vinl. It is meant to provide a snapshot of the important information for a model and access to easy editing of the model parameters.

Selecting Available Models

The user can select the available buffer models in the IBIS file by using the **Model** selector box. Once selected the applicable data fields will be populated.

Editing Data

Any of the data fields in the IBIS Model Summary can be edited by selecting the **Edit** button. To apply the changes to the actual IBIS file the user must select the **Save** button. A popup dialog box will inform the user that changes have been made to the IBIS file.

Assigning a Tech Value Type

The Tech data field is not an IBIS Specification keyword but allows the user to assign any interface technology label to the buffer model. This is useful for identification purposes so the user can identify model parameters with known technology interface specification values. The Tech parameter is stored as a special character code in the [Model] section of the IBIS file.

Quality Level

A buffer model quality level can be assigned to each individual buffer model using the same quality levels as defined in the IBIS File Summary section. The user can also get the calculated quality level by using the Quality Checker GUI and generating an HTML report.

Editing the Model Spec and Receiver Thresholds

The IBIS Specification allows for optional advanced sub-keywords for buffer models that enhances the data for the buffer model as well as adds extra capabilities in EDA simulation tools. The user can select the **Model Spec** button to view any existing [Model Spec] parameters and add new ones. The user must

select the **Save to model** button to apply changes to the model buffer in the IBIS file. The user can also edit, add, and save the [Receiver Thresholds] keywords in the same manner using the **Receiver Thresholds** button.

If a common set of [Model Spec] parameters are being used they can be saved using the **Save** button and then loaded using the **Load** button. This allows the user to only have to create one [Model Spec] parameter file for each technology interface.

Adding Test Data

The IBIS Specification keyword [Test Data] allows waveform data of a buffer model to be stored for correlation purposes. SharkSim allows the user to load buffer model waveforms and add them to the existing buffer model using the [Test Data] keyword. The user can select the **Define Test Load** button to select a test load and define the parameters. Then the user can select the **Define Test Data** button and load the waveform data to view it and then have it added to the buffer model in the IBIS file or save as a .testdata file for later use.

Select Topology

The user needs to select either **Single_ended** or **Differential** as the test load topology.

Select Load

The user needs to select either **Standard** or **Transmission Line** as the test load topology.

Specify Process Corner

The user can select the **include min/max corner** checkbox to load typ/min/max data.

Define Test Load

The user can select the **Define Test Load** button to open up a new GUI to define the test load parameters.

Select Test Load

There are 27 different test load options to choose from. These are predefined test loads that are a subset of the available test load combinations allowed by the IBIS specification. This subset of test loads should accommodate almost any design including single-ended or differential buffers. Below are the different available loads to choose from:

Capacitive: A capacitor to ground.

RC Series: A series resistor and capacitor to ground.

RC Parallel: A resistor and capacitor to ground.

LC Series: A series inductor and capacitor to ground.

Pullup: A resistor to a voltage source.

Pullup with Cap: A resistor to a voltage source and a capacitor to ground.

Pulldown: A resistor to a voltage source.

Pulldown with Cap: A resistor to a voltage source and a capacitor to ground.

Thevenin: A resistor to a voltage source V_{term1} and resistor to a voltage source V_{term2} .

Rdiff: A differential resistor placed between the inverting and non-inverting output pins of a differential buffer.

TLine with Cap: An ideal lossless transmission line with a capacitor to ground.

TLine with Rcvr: An ideal lossless transmission line with an IBIS input buffer model.

Series TLine with Cap: A series resistor with an ideal lossless transmission line and a capacitor to ground.

Series TLine with Rcvr: A series resistor with an ideal lossless transmission line and an IBIS input buffer model.

TLine with RC Parallel: An ideal lossless transmission line with a resistor and capacitor to ground.

TLine with Pullup: An ideal lossless transmission line with a resistor to a voltage source.

TLine with Pullup and Cap: An ideal lossless transmission line with a resistor to a voltage source and a capacitor to ground.

TLine with Pullup and Rcvr: An ideal lossless transmission line with a resistor to a voltage source and an IBIS input buffer model.

TLine with Pulldown: An ideal lossless transmission line with a resistor to a voltage source.

TLine with Pulldown and Cap: An ideal lossless transmission line with a resistor to a voltage source and a capacitor to ground.

TLine with Pulldown and Rcvr: An ideal lossless transmission line with a resistor to a voltage source and an IBIS input buffer model.

TLine with Thevenin: An ideal lossless transmission line with a resistor to a voltage source V_{term1} and resistor to a voltage source V_{term2} .

TLine with Thevenin and Rcvr: An ideal lossless transmission line with a resistor to a voltage source V_{term1} and resistor to a voltage source V_{term2} and an IBIS input buffer model.

TLine with Rdiff: Two ideal single-ended lossless transmission lines with a differential resistor placed between the inverting and non-inverting output pins of a differential buffer.

TLine with Rdiff and Cap: Two ideal single-ended lossless transmission lines with a differential resistor placed between the inverting and non-inverting output pins of a differential buffer and a capacitor to ground on each differential output.

Input Test Load: An ideal voltage source (defined in Input Source section) with a series resistor and an ideal lossless transmission line connected to the SPICE input.

Black Box Load: Any SPICE compatible subcircuit load connected to the output buffer pin with an IBIS input buffer model.

Test Load Parameters

There are some extra test load parameters beyond the load variables (such as resistor R1, etc.) that need to be defined.

Test Data Name: The name of the [Test Data] that will appear in the IBIS file.

Test Load Name: The name of the [Test_load] that will appear in the IBIS file.

Driver Model: The name of the **Driver_model** that will appear in the IBIS file. This has to be the name of an output type buffer in the same IBIS file.

Receiver Model: If used this has to be the name of an input type buffer in an IBIS file that is specified in Receiver File.

Receiver File: If used this has to be a compliant IBIS file with the appropriate input type buffer specified.

Black Box Model: If used this has to be an HSPICE compatible subcircuit file with a .sp extension.

Input Source

The user must specify the input source parameters to be used as the input stimulus for the test load data generation.

Vlow: Input low voltage.

Vhigh: Input high voltage.

Delay: Input source delay time.

Edge: Input source edge rate. (Same for both rising and falling.)

Pulse Width: Input source pulse width.

Period: Input source period.

Sim Length: Overall test data generation simulation length.

Source: The user can select between three different input source types:

Edge: A rising and falling edge.

Pulse: A repeating 0101... pattern.

PRBS: A PRBS pattern as specified by user.

PRBS Pattern Load: The user can specify the PRBS pattern by entering it manually in the data field or by loading a .txt text file with only a '0' or '1' used for the pattern definition.

Define Test Data

The user can select the **Define Test Data** button to load the test data files to view them and save them as either .testdata files or have them automatically added to the IBIS file.

The test data files need to have a .LIS extension and should be in a Voltage-Time format with time on the x-axis and voltage on the y-axis. The order of the data should be in column format as follows: time, typ, min, and max. The filename should be specified as test_load_stnd_typ.lis, test_load_stnd_min.lis, and test_load_stnd_max.lis. Furthermore, the data columns should be surrounded by the 'x' character at the beginning and the 'y' character at the end. There is an example file in the release directory.

Graphing

Overview

SharkSim offers powerful graphing of the buffer model data in an IBIS file and also includes some advanced viewing and editing features.

The Model Data Viewer GUI shows all of the available data sets in a buffer model including [Sub Model] and [Test Data] waveforms as well as the standard IV and VT data curves. The Typical/Minimum/Maximum data curves are displayed in different colors with different graph icon identifiers.

Opening Model Data Viewer

The Model Data Viewer can be opened by going to the navigation menu item **Validate | Graph Data** or by using the hotkey F7. The Model Data Viewer by default shows the first buffer model data set graph in the main window. The window can be resized using the Windows maximize button.

The Model Data Viewer can also be opened from the tree navigation pane in the main editor window. The user can right click on a [Model] keyword or IV/VT keyword (such as [Pulldown] and [Rising Waveform]) and then select the popup dialog box that says **Graph Data**. The Model Data Viewer will be opened with the select data set in the graph window.

Selecting Available Buffer Models

Using the **Models** pulldown box the user can select which buffer models in the IBIS file to view and graph data from.

Selecting Available Buffer Model Data

Using the **Graphs** pulldown box the user can select which data sets to graph from the selected buffer model. SharkSim supports all IBIS Specification data sets including [Sub Model] and [Test Data].

Support for Combined Data Curves

Using the **with Power Clamp** and **with GND Clamp** checkboxes below the **Graphs** pulldown box the user can graph the combined IV curves for a selected buffer model. This option is only available for IV data curves.

Support for Multiple Graphs

Using the **Multiple Graphs** checkbox the user can graph multiple data curves from the same buffer model. Once the user selects the **Multiple Graphs** checkbox each graph selected in the **Graphs** pulldown box will be graphed with the existing data curve. The user can select the **Clear Graphs** button to clear the graph screen and start over again.

Selecting Process Corners

The different buffer model process corners Typical/Minimum/Maximum as defined in the IBIS Specification can be turned on/off by selecting the corresponding checkboxes.

Selecting Graph Types

The user can select how the data sets are graphed by selecting one of the graph icon boxes in the upper right hand corner.



This option shows the line and the data point in the graph.



This option shows only the line in the graph.



This option shows only the data points in the graph.

Zooming/Fit to Screen

By holding down the left mouse button and drawing a rectangle downwards the graph window can be zoomed in. By holding down the left mouse button and

drawing a rectangle upwards the graph window can be zoomed out. The user can also right click and select different zoom options.

The graph window can be automatically resized to fit the screen by selecting the **fit to screen** button as well as right clicking the mouse and selecting the fit to screen option.

Panning

Panning is supported by using the arrow keys on the keyboard.

Track Curve

By selecting the **Track Curve** checkbox the user can trace the data on a graph. The white circle shows which data curve is selected and where the current data point is. The current data point is shown in the left hand corner in the **Curve coords** data field. The Track Curve feature interpolates the current data point if it is between actual data points in the data set. By selecting the **Data points only** checkbox the curve tracker will only display data points from the data set.

Go to Data Line in Editor

In the **Track Curve** mode with the **Data points only** checkbox selected the user can right click and select the **Go to Data Line in Editor** option to highlight the data point in the data set in the main editor window. This feature is useful for debugging IBIS Parser issues.

Edit Curve

By selecting the **Edit Curve** checkbox the user can select any available data point and move it vertically up or down. The selected data point will be in a white circle and the data point can be moved by left clicking on the data point, dragging the data point up or down, and then releasing the mouse button. The undo button can be used to undo any changes made to the graph. When the user selects a different graph from the **Graphs** pulldown box a popup dialog box appears asking the user if they want to save their changes or discard all changes. To save changes the user should select Yes.

Help

The **Help icon** can be selected to open the Help HTML file in the default web browser.

IBIS Reporter

Overview

The IBIS Reporter allows the user to create a custom HTML report on the IBIS file using various data formats and sources as well as a compliant IBIS Quality Specification 2.0 report.

Creating a New Custom Report

The IBIS Reporter allows the user to create a custom HTML report on the IBIS file using various data formats and sources. The IBIS Reporter can be opened from the navigation menu **Reports | Generate Custom IBIS Report**. By default the IBIS Reporter pulls some of the main IBIS file keyword data into the header section that will be put at the beginning of the report. The following data keywords are available for use in the header:

File Name

IBIS Version

File Revision

Source

Manufacturer

Component

The user also has the option to include the Notes section of the IBIS file as well as the IBIS Parser Results if the ‘**Add IBIS Parser Results to IBIS File**’ feature was used in the main editor application. The current timestamp will also be added to the header as well.

The user adds data to the report by using the **Report Elements** feature. The user can select the **New** button to add a new report element. Multiple report elements can be added (even for one model) and the user can move and delete the order of the report elements.

Once a new report element has been created the user can use the **Element Detail** section to add data to be included in the report. The user can select from the available IBIS buffer models in the IBIS file using the drop down selector box **Model**. Once selected, the user can add a description of the data to be added. For example, if the user were going to add a screenshot image of the IBIS correlation waveforms that text could be entered in. This header text will show up in the final report. Then the user can browse to any file type including JPG and HTML and by selecting the **Update Details** button the header text and associated file will be added to the report. This can be done for multiple times for an individual model and multiple times for an IBIS file. The Report Elements section is updated with the model, the associated file, and the header text.

To create the final report the user needs to select the **Generate HTML** button to create the overall HTML report for the IBIS file.

Saving a Custom Report

The user can select the **Save Report** button to save the current settings of the Report Elements as a .report file. This is a useful feature so the user can easily go back and modify only sections of a created report.

Loading a Custom Report

If a report has been saved the user can use the **Load Report** button to load the saved settings into the IBIS Reporter and then edit the report.

Creating a Quality Checklist Report

The user can create an IBIS Quality Checklist report that is compliant with the IBIS Quality Specification 2.0 by going to **Reports | Generate IBIS Quality Checklist Report**.

The user can enter a URL for the datasheet for the device as well as a report version. The user can also add optional contact information such as email or phone support numbers.

The user can select a buffer model from the drop down list and then use the browse button to find the HTML report created from the Quality Checker GUI. It is recommended to have this HTML report edited for final viewing. The user can enter any applicable notes or other model information in the text area and then load the HTML report file. The user can repeat this for all of the buffer models in the IBIS file.

When the user creates the final HTML report using the **Generate HTML** button an HTML report will be generated. The report automatically pulls in some of the information from the IBIS file such as the vendor name and IBIS file and uses the Quality Level fields in the Quick Editor to list out the overall quality level of the IBIS file as well as the quality level of the individual buffer models. Finally the HTML reports with the details quality checks are included.

This HTML report is IBIS Quality Specification 2.0 compliant and can be used to document the quality levels of IBIS models and be given out as a compliance document to end customers.

For advanced users the correlation waveforms from the Correlation and Simulation GUI can be used in this report as well to add the correlation levels if needed.

Advanced Features

Overview

This section describes some of the advanced features of the SharkSim application in further detail.

SPICE Integration

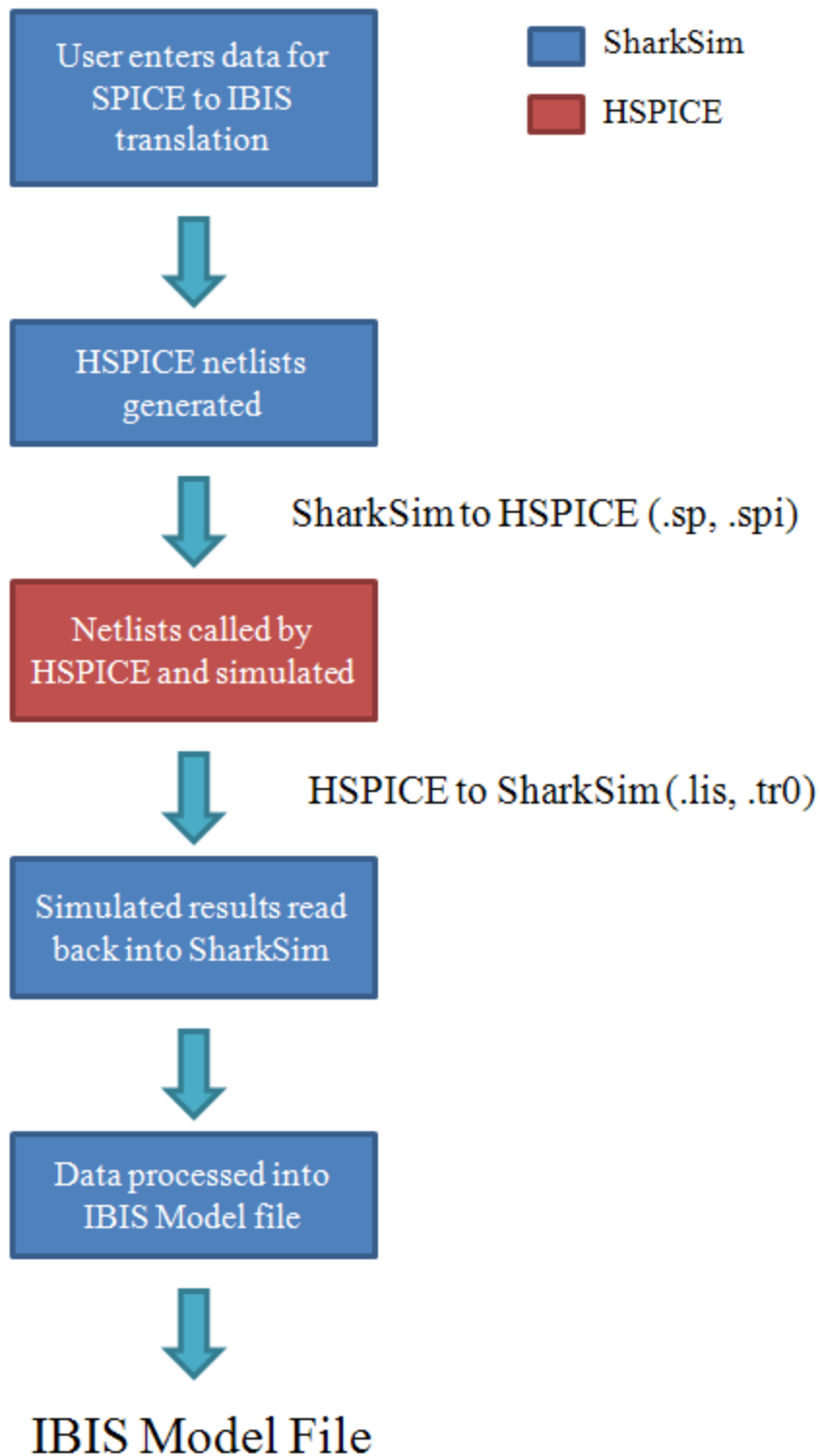
The SharkSim application allows the user to call external SPICE applications to take advantage of some of the advanced features in the application such as the SPICE to IBIS translation features and the IBIS Simulation and Correlation features. SharkSim supports Synopsys HSPICE by default and can be configured to support other SPICE applications as well. A separate license is required for all external SPICE applications.

HSPICE Integration and Support

The SharkSim application can use the Synopsys HSPICE engine to automatically create HSPICE netlists, run simulations, and then extract data from the .lis files and process the data into a formatted IBIS file.

The overall flow is that SharkSim generates different types of HSPICE netlist files in .sp format and will then call the HSPICE simulator externally to simulate the generated netlists. The output data files in .lis format will be read in by the SharkSim application and the data will be processed and formatted in various model formats.

The flow diagram below describes the interoperability between SharkSim and Synopsys HSPICE for the generation of IBIS files.



Other SPICE Application Support

The SharkSim application can use any external SPICE application to run simulations and process the data into various model formats. The user can set the SPICE application executable path in the **Preferences** section of the application.

Currently SharkSim supports Synopsys HSPICE compatible executable calls and formats by default. As of version 2.0 Mentor Graphics Eldo and Cadence Spectre is also supported. If support is needed for a non-compatible SPICE application the user should contact SharkSim support.

IBIS Parser

The SharkSim application calls the stand alone IBIS Parser executable to parse and display any error or warning messages in the IBIS file. The user can point to any executable that they want to. This is useful for debugging purposes to point to older IBIS Parser versions as well as being able to point to the latest IBIS Parser release. The IBIS Parser can be downloaded for free from the IBIS Group website.

Keyword File

The Keyword File (keywords.txt) is an ASCII based text file that the SharkSim application uses to parse the full IBIS file. The Keyword File is setup to be easily modified for future IBIS Specification releases as well as adding custom keywords to the SharkSim editor. The hierarchy of the Keyword File is setup as key/value pairs so parent/child attributes can be easily added. See the keywords.txt file in the release directory for a full explanation and example of how the file is setup.

If custom keywords are added to the Keyword File the SharkSim editor will apply the proper syntax highlighting in the editor but if it is not an IBIS Specification keyword it will not be processed by some of the checking capabilities of the application and will cause errors in the IBIS Parser. Custom keywords are useful for companies that have internal CAD process flows that require additional information be added to the IBIS file as well as other uses.