Analogy®

Saber®

The standard in mixed-signal and mixed-technology simulation

- Analyze complete designs that include electrical, mechanical, hydraulic, controls systems and other technologies
- Gain complete control of simulation through the intuitive, graphical user interface
- Get more accurate and efficient results via single-kernel simulation of mixed-signal circuits or systems
- Examine performance using steady-state, time, frequency, statistical quality, reliability and controls analyses
- Access the Saber simulator in all popular EDA environments for interoperability, common modeling language, information sharing and standard library support

Overview

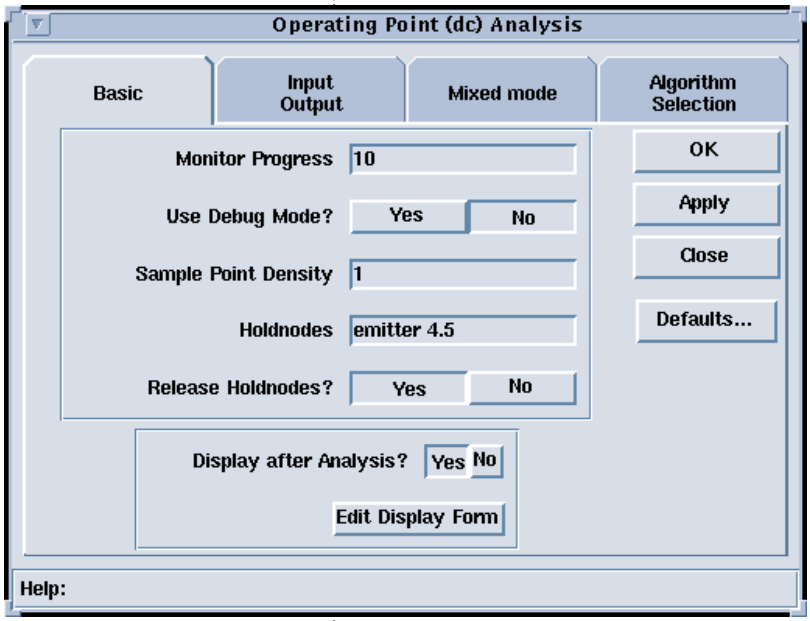
The Saber analog and mixed-signal simulation engine is the core of Analogy's SaberDesigner™ analysis environment. Introduced in 1987, Saber was developed by a team of simulation specialists, expert in both mathematical simulation and hardware design. Saber completely changed the status quo of analog simulation with a structure that supported a hardware description language and a single-kernel mixed-signal simulation solution. Application of improved solution methods and algorithms resulted in a simulator that is faster, more robust and more widely applicable than competitive products. Since its inception, Saber has continually advanced the standard for analog, mixed-signal and mixed-technology simulation.

Saber is a mathematical engine that solves the network of equations represented by the models and their connections in your circuit or system. The simulator is accessed by a highly interactive graphical user interface that provides an easy-to-use means of analyzing your design, operating the simulator and obtaining and viewing your results.

Whether you are an engineer primarily concerned with simulating a design, a developer responsible for building the most accurate and comprehensive behavioral models, or a professional who works in related applications, Saber provides the simulation capabilities, features and accuracy you'll need to get the job done accurately and on time.

Mixed-Signal Functionality

Saber is a full-fledged single-kernel mixed-signal simulator. A built-in event queue, coupled with Analogy's MAST® hardware description language, accommodates event processing, boolean logic, and continuous mathematical expressions and relationships. This allows Saber to simulate analog, event-driven analog, digital, and mixed-analog/digital devices in the same simulation — while providing complete interaction between the analog and digital domains. Saber eliminates the need to partition a mixed-signal design into separate simulations.



SaberGuide provides tabbed forms to help you organize and enter information required to conduct analyses in Saber.

For target systems that are predominantly digital, with only small amounts of analog circuitry, you may choose to use a co-simulation approach for analysis. To support these situations, Analogy offered the first mixed-simulator product on the market. The mixed-simulator tool uses Saber to analyze the analog portions and the digital simulator to analyze the digital portions.

Today, Saber is linked with these other popular digital simulators — Verilog, QuickSim II, and ViewSim. To effect this linkage between analog and digital simulation, Analogy developed the patented Calaveras® Algorithm. Calaveras allows both simulators to operate at maximum efficiency, exchanging information only when required. The result is seamless interaction when performing analysis between the analog and digital domains.

Mixed-Technology Simulation

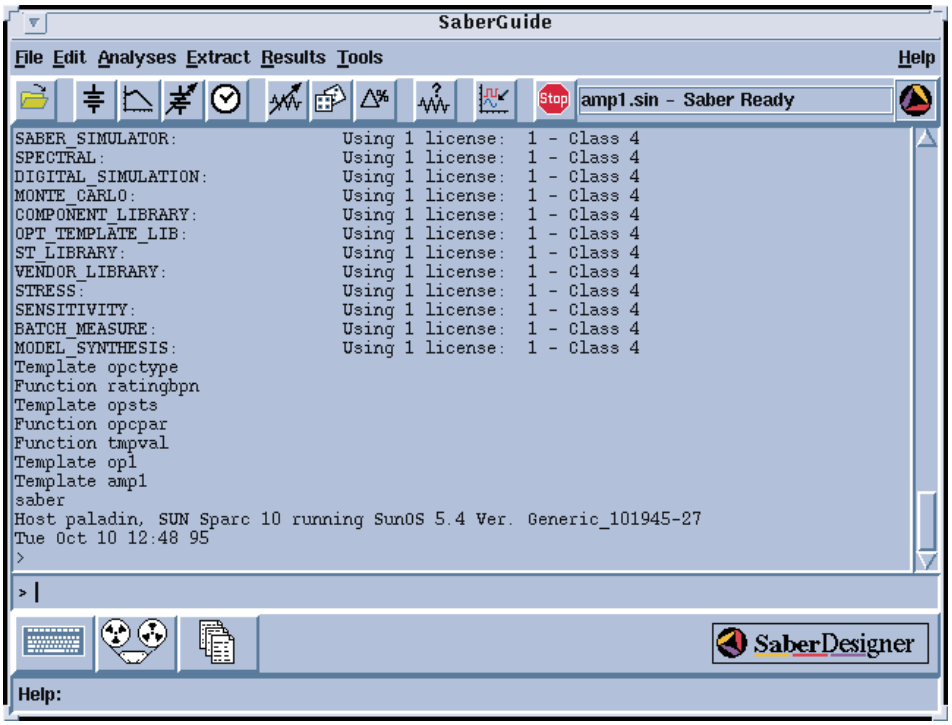
Saber is designed to perform simulations based on very few preconceptions about the target system. As a result, the simulator can analyze designs containing multiple technologies, using the analysis units native to those technologies:

- electronic
- power electronics
- electro-mechanical
- mechanical
- electro-optical
- optical
- hydraulic
- controls systems
- sampled-data systems, etc.

As such, if the behavior of a device can be expressed in mathematical terms, Saber can model and simulate it — up to the system level — with an accurate representation of interactivity between the technologies. Given this capability, models can be created directly using the actual equations and relationships that govern the behavior of devices — not electrical macromodel equivalents. With Saber, any mix of technologies can be simulated, and all simulation results will be output in the corresponding units.

Robust Convergence Analysis

Saber's solution algorithms were carefully chosen to minimize the possibility of encountering convergence problems — the inability of the simulator to arrive at a mathematical solution — which occur in all simulators. Saber uses five robust solution-algorithms sequentially to solve convergence prob-



SaberGuide provides graphical iconic interface with Saber while retaining the command line.

lems. If one algorithm fails, Saber automatically steps to the next and more powerful algorithm. During system evaluation, Saber performs a piece-wise linear evaluation of the exact system of equations, with the resulting linear system being solved exactly. This way, even difficult simulation problems, like sharp signal transitions during transient analysis, can be managed successfully.

Simulation Accuracy

When you perform a simulation, you need to be confident your results accurately reflect the operation of the physical system. Saber applies mathematical approximations to real-world system behavior. In systems with continuous values, such as analog designs, some computational error will always be associated with simulation results. In reality, all simulators make trade-offs between simulation accuracy and computational cost — increasing the accuracy parameters of the simulator can result in longer simulation times. Based on Analogy's design and simulation experience, Saber's default accuracy controls are balanced to provide high-accuracy results with acceptable computation run times.

All analog simulators give users control over accuracy. Unlike other simulators which may have multiple interdependent accuracy controls, Saber requires only two. And, they are mutually exclusive. The Saber Density parameter controls the accuracy of non-linear device behavior. If your system has highly non-linear models, you may want to increase the value of Density to determine whether it changes your simulation results.

The Truncation Error parameter defines how much a predicted solution varies from a calculated solution for any point in time. Increasing the value of Truncation Error may, depending on the nature of the system, increase results accuracy.

Since the Density and Truncation Error parameters operate independently, you gain maximum flexibility and control over the analysis.

Models Separate from Simulator

With Saber, the simulation model libraries are completely separate from the simulator. This unique configuration allows you full access to, and control of, the model libraries. Most of the templates are in plain ASCII, and written in MAST– Analogy's efficient, powerful and flexible hardware description language.

You can view the contents of a template, make changes to it, or use it as the starting point for another template. Create your own models and add them to the libraries – or start your own library. You use the same language (MAST) that Analogy uses to develop models. You can also add models or subroutines written in C, C++ and FORTRAN.

SaberGuide™ Your Doorway to Productivity

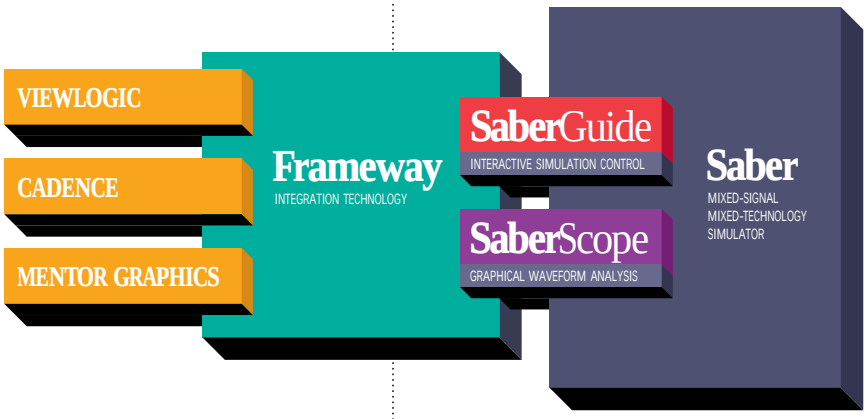
SaberGuide is your intuitive and interactive doorway into the Saber simulator. Within its Windows-like simulation environment, pull down menus, icons, pop-up dialog boxes and on-screen help make it easy for you to set up and run simulations. SaberGuide lets you change variables, alter component parameters, stop/restart a simulation at any time, or invoke the companion SaberScope™ waveform processor. Since all tools in the SaberDesigner environment share a common interface, you can work faster and more efficiently.

To get your simulations off to a quick start, most of Saber's control settings are preset. Through SaberGuide's pop-up menus and dialog boxes, default parameters are displayed and can be quickly modified by the user. Also, controls you need to use are highlighted for you. This high degree of results-oriented interactivity makes better use of simulation time. Through SaberGuide, you can define parameters, start the simulation, stop it, change a

component value on the fly, then restart the simulation. You can even extract a starting point from a point within a previous simulation.

Support For Popular CAE Frameworks

Saber operates within the SaberDesigner graphical environment and can be integrated into the design frameworks offered by Cadence Design



Systems, Mentor Graphics® and Viewlogic® by employing Analogy's Frameway® Integration technology. You gain full and easy access to all features and capabilities of the Saber simulator even when you access it through the host provider's graphical environment.

Comprehensive Analysis Support

Saber supports all the standard analog simulation analyses – DC Operating Point, Transient, and AC Noise, Distortion and Fourier Spectral analyses are also available in the Spectral Analysis Option. For more detailed investigations, Saber and the InSpecs® family of design analysis products give you the ability to perform Monte Carlo, stress, sensitivity and parametric analyses. All analyses can be performed on systems containing any mix of technologies.

View the Possibilities

Generating simulation data is only one facet of successful system analysis. Within the SaberDesigner environment, you can view and analyze resultant data graphically using the powerful, yet easy-to-use, SaberScope™ graphic waveform analyzer. Saber creates a default-results file for you. If you want, you can specify which simulation results to extract and which to ignore. Then, you can use SaberScope to view signals and parameters deep within the hierarchy of a system or model, or simply glance at primary waveforms. If you need to see additional signals, you can extract them without rerunning the simulation. This unique feature saves you simulation time and makes it easier to zero in on the data most important to your particular task.

Ordering Information

Saber Mixed-Signal Simulator includes MAST HDL and SaberGuide	Part No. - AA07
SaberScope Graphical Waveform Analyzer	Part No. - SD03

Frameway integration, mixed-signal interfaces and design analysis products are also available from Analogy, Inc. Access the Saber simulator through all the popular EDA environments.

Analogy®

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