Kronos Characterizer

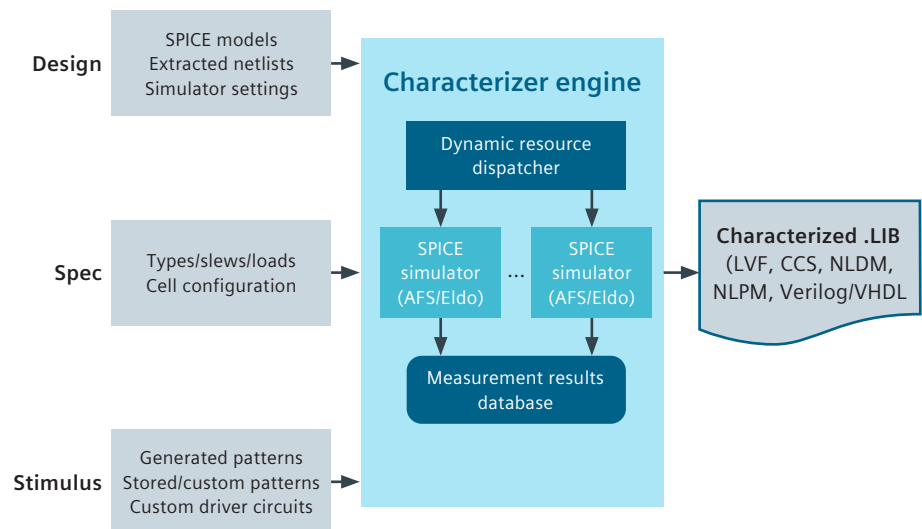## Library Characterization

Features

- Performance

  - High throughput with fast runtime and multi-simulation job control

  - Native integration with Siemens' AFS & Eldo for high performance

  - Highly scalable architecture, parallelizable up to 1000's of CPUs

  - Dynamic resource scheduling for on-the-fly modification of CPU resource pool size

  - Disk I/O optimized to minimize file object usage for improved data storage utilization

- Variation modeling

  - Fast and accurate LVF for timing, power, and constraints with full SPICE accuracy

  - Supports LVF Moments for non-Gaussian distributions

- Customization and ease-of-use

  - Handles all Liberty technology setups and custom configurations

  - Supports quick configuration by importing an existing library

  - Generates reusable components for rapid reuse with other technologies

- Re-characterization capabilities

Library characterization is a key factor in today's design flows. Modern static timing analysis (STA)-based design flows depend on characterized Liberty® models to work. In order to achieve the aggressive power, performance, and area metrics of today's semiconductor products, design teams rely heavily on accurate characterization of Liberty models.

Kronos Characterizer is a high-performance and highly-scalable library characterization tool that generates Liberty and Verilog/VHDL models for a wide variety of cells. It produces accurate Liberty models for standard cells, multi-bit cells, and I/Os, within an advanced, integrated environment. The tool supports complex stimulus creation and measurement methods, as well as versatile control of output model syntax such as pin structures and table requirements. It is easy to use, supports advanced models, and allows many user customizations.

Kronos Characterizer fully supports the Liberty Variation Format (LVF) for variation modeling. For timing, power, and noise, it supports NLDM (Non-Linear Delay) models as well as CCS (Composite Current Source) models for improved accuracy.

Kronos Characterizer is a high-performance, high-throughput, general purpose cell library characterization tool for standard, multi-bit, and I/O cells.

Kronos Characterizer

- Re-characterization flow adds new functions to existing libraries or creates new libraries

- Accounts for changes in process models, cell layouts, and SPICE models

• Characterization outputs

- Liberty, Verilog, and VHDL/VITAL models

- NLDM & CCS timing, power and noise and state-dependent models

- LVF and Moments

- IBIS model generation and validation

High performance, high throughput library characterization
Kronos Characterizer's advanced algorithms and efficient job distribution reduces characterization time significantly. During characterization, SPICE simulations are continuously monitored. Numerous data checks and recovery mechanisms significantly improve turn-around time by pinpointing specific model results.

Kronos Characterizer is highly scalable and has been tested to scale almost linearly, up to thousands of CPUs. To help fully optimize compute clusters for large-scale characterization jobs, the tool's dynamic resource scheduler supports on-the-fly modification of the CPU resource pool size, allowing users to grow or shrink compute pool resources without restarting characterization jobs.

Siemens' SPICE simulators Analog FastSPICE™ (AFS) and Eldo® are supported by Kronos Characterizer. The native integration between AFS/Eldo and Kronos Characterizer is optimized to take full advantage of these simulators' performance, accuracy, and quick elaboration.

Fast and accurate variation modeling
Process variation has significant effect on timing, power, and noise characteristics of modern libraries, especially at 20/22nm and below. Due to the high number of simulations required to produce accurate LVF models, variation modelling has become a significant factor in library characterization runtime for advanced process nodes.

Kronos Characterizer provides full support for productionaccurate characterization of LVF models with SPICE-level accuracy, while minimizing runtime. It also supports LVF Moments for more accurate handling of asymmetric/non-Gaussian distributions.

Highly customizable and easy to use
Kronos Characterizer can be quickly and easily configured by importing an existing library. Typically, this configuration

is validated in comparison to the original data. Once complete, the tool can generate a template-based flow to enable support of multiple technologies from a single source of cell configuration data. The tool's comprehensive support of Liberty modeling methods handles all technology setups and also supports userdriven, custom configurations.

Streamlined library re-characterization flow
Kronos Characterizer's re-characterization flow auto-imports and characterizes existing libraries to account for changes in process models, cell layouts, SPICE models, voltage thresholds, and special voltage requirements. The re-characterization flow automatically updates functions to existing libraries or creates a new library using updated characterization results. This reduces up to 90% of user input and flow configuration time for library updates.

Versatile support for library characterization outputs
Kronos Characterizer supports Liberty, Verilog, and VHDL model library characterization outputs. The tool supports NLDM and CCS for timing, power, and noise, LVF (including LVF Moments) for variation, and IBIS model generation for I/O validation. The tool creates state-dependent models for timing and power and supports comprehensive control of state coverage.

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