

Variety

Improve your view...

Variety is an ultra-fast standard cell characterizer of process variation aware timing models. It generates libraries that can be used with multiple statistical static timing analyzers (SSTA) without requiring re-characterization for each unique format. Variety calculates non-linear sensitivity accounting for systematic and random variation for any set of correlated or uncorrelated process parameters. The resulting libraries can be used to model both local (within cell and within die) variations and global die to die variations.

Statistical static timing analysis (SSTA) provides a more realistic estimation of timing relative to actual silicon performance, often reducing worst-case timing margins by 10–15%, resulting in a higher yielding design that can be taped out sooner.

To accurately predict variation, SSTA needs variation aware timing models that account for both systematic process variations (e.g. variations due to lithography) and random process variations (e.g. variations due to doping fluctuations between transistors).

Statistical Timing Models

Variety creates models for SSTA consumption by characterizing each cell for a given set of process parameter variations where the amount of variation is based on statistical SPICE models or actual process measurements. The non-linear sensitivity to process variation for all relevant timing con-

structs is captured including delay tables, slew tables, pin capacitance and timing constraints. Advanced current source models (CCS and ECSM) are also supported.

Variety can generate multiple SSTA formats from a single characterization database (.ldb). XT format (used by Extreme Design Automation), S-ECSM format (used by Cadence Design Systems) and both the multiple Liberty® files and a single Liberty® file with CCS variation aware extensions (used by Synopsys) are supported. Custom SSTA formats can be easily supported using a Tcl API to the characterization database.

Process Parameter Variation

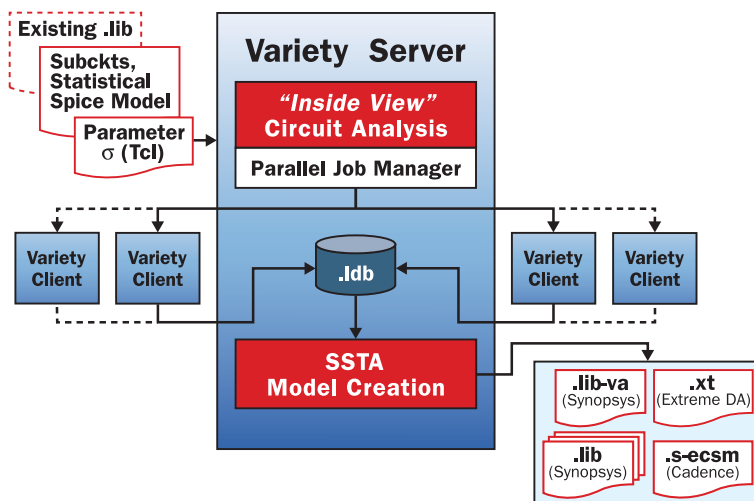
Parameter variations can be characterized as uncorrelated, correlated or partially correlated. Uncorrelated parameter sets are simulated independently while correlated parameter sets are simulated together. Partial correlation is supported through the use of a correlation matrix provided by the foundry.

Any process parameter present in the input SPICE model can be characterized including physical parameters such as XL or Vth or intermediate parameters that have been derived from principle component analysis (PCA).

Systematic and Random Variation

For systematic inter-cell variation, the process varies in the same direction by the same amount for each transistor inside a cell. Systematic variation can be used to model both on chip (local) and off chip (global) variation.

Random intra-cell variation models the process variations that apply to each transistor independently (also known as mismatch). To characterize random variation efficiently Variety deploys a patent pending “inside view” pre-analysis that avoids characterizing every transistor uniquely for



every table entry. This proprietary method reduces the overhead for random variation characterization by 10X or more and has been validated to be highly accurate when compared against Monte-Carlo simulations.

Variety can fully exploit a large network of multi-core CPUs via intelligent job distribution (with or without a job queue management system) to achieve almost linear speedup per CPU. Characterization tasks can be performed using Variety's internal SPICE simulator or by an external simulator such as Spectre®, Eldo® and Hspice® at any level of granularity from a single arc to a complete cell.

Variety LX Option

The Variety LX option combines all the standard library characterization features of Liberate with Variety. This enables a single characterization system to generate both statistical and non-statistical models that are consistent in state dependency and characterization methods, enabling seamless migration from regular static timing analysis to SSTA.

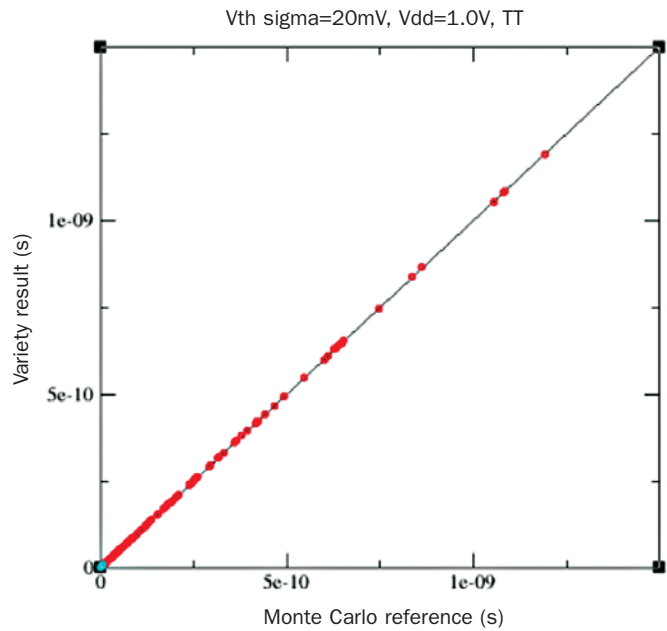
Variety is available on:

Solaris 9, 10

RedHat Enterprise Linux 3 update 8 or later

Enterprise Linux 4 update 4 or later

CentOS 3.8 or later, 4.4 or later



Variety's Random variation result vs. Monte Carlo SPICE Simulation

Feature	Benefit
Highly accurate models with non-linear sensitivity	Reduces Time to Market, improves Yield
Common engine with Liberate™	Consistency between SSTA and STA
Supports multiple formats from a single characterization	Enables multi-vendor design and signoff flows
Random variation with 10X less overhead	Reduces Library characterization TAT
Performance to handle large number of process parameters	Improves silicon correlation

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