

Liberty NCX

The Fastest Path to Production Current-Source Libraries

Overview

At process technologies of 65 nanometers and below, designers face a plethora of new modeling challenges such as high-impedance interconnect, Miller effect, driver weakening, low power design and increasing process variation. Current-source modeling technology effectively addresses these challenges. Current-source models increase accuracy by using current waveforms instead of delay and slew values in the library. Proper segmentation and verification of current waveforms are crucial to current-source model fidelity. Previous-generation library characterization engines were designed for delay and slew measurements and lacked the infrastructure to support efficient current waveform segmentation and verification.

The Liberty™ NCX solution is a complete library delivery system specially architected for current-source models that features an optimized, single-pass Composite Current Source (CCS) library generation flow that performs simultaneous characterization and model accuracy verification. Liberty NCX also includes a suite of library quality assurance, compaction, merging, scaling and adaptation tools. These tools provide unsurpassed flexibility in delivering verified libraries at scaled voltage or temperature corners for tool flows from multiple vendors. Liberty NCX supports all the latest Liberty modeling innovations approved by the Liberty Technical Advisory Board (TAB).

At-a-glance

- Optimized, single-pass Reference Characterization System for CCS model generation
 - Dynamically adjusts waveform segmentation and simulation settings to ensure highest accuracy CCS models
 - Native base curve compaction ensures smallest .lib file size
 - Supports CCS timing, noise, power, as well as variation-aware (statistical) characterization
 - Simplified, intuitive characterization setup whether it is a new library or a recharacterization of an existing .lib
- Multi-core support and tight integration with gold-standard HSPICE® simulation deliver industry-leading fast runtimes
- Model adaptation system that supports model compaction, voltage/temperature scaling and third party current source or legacy non-linear delay model (NLDM) abstraction
- Supports latest open-source Liberty innovations approved by the Liberty Technical Advisory Board (TAB)

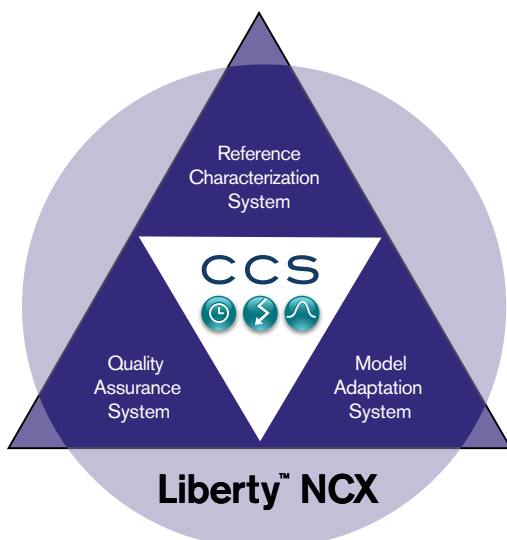


Figure 1: Complete library delivery system

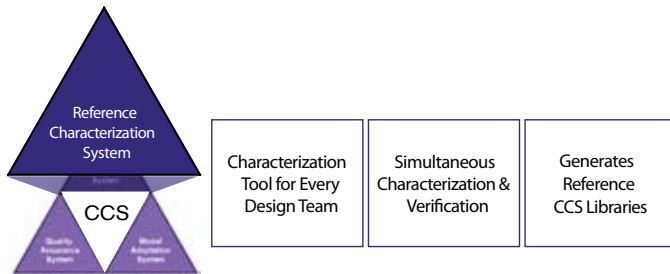


Figure 2: Reference characterization system

Reference Characterization System

Liberty NCX was architected from the ground up for CCS model generation. It features a simplified, intuitive user interface that puts characterization within the reach of every design team. The tool delivers high accuracy by performing simultaneous characterization and verification of each current waveform and dynamically adjusting segmentation and simulation settings to ensure model fidelity.

Liberty NCX delivers excellent performance by reducing the number of simulations and taking advantage of HSPICE client-server models for faster throughput. Adaptive, fine-grain simulation job parallelization ensures the fastest library turnaround time whether you are running on a single CPU, a multi-core machine or a large server farm.

CCS Library Quality Assurance System

The quality assurance system in Liberty NCX consists of a set of functions that allow a designer to ensure that a CCS characterization has adhered to the proper guidelines and will deliver the best quality of results. In addition to syntax checking and screening for basic rule violations, Liberty NCX performs very important quality assurance checks called validation and correlation. Library validation is an exhaustive grid-point-by-grid-point analysis of the library and is a fast, simple way to ensure library quality. For

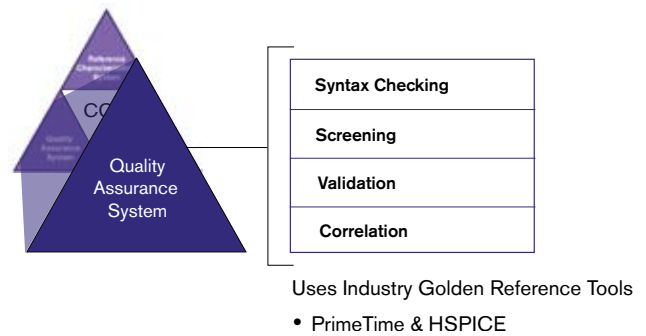


Figure 3: CCS Library quality assurance system

CCS timing, Liberty NCX performs validation by ensuring that the correct cell delay and output slew values can be derived from the current waveforms in the library and provides a comprehensive HLML report with all the details. Library correlation is an automated step that uses the industry’s golden PrimeTime sign-off tool and HSPICE simulation to evaluate the accuracy of a given CCS library.

Cell Coverage

- Standard cells including single- and multi-output combinational cells
- Flip-flops and complex latches
- Tri-state cells, bus holder cells
- Multiplexers, including one-hot MUXes
- Multi-voltage cells and I/Os
- I/Os with differential inputs
- Bidirectional I/Os
- Multi-mode cells

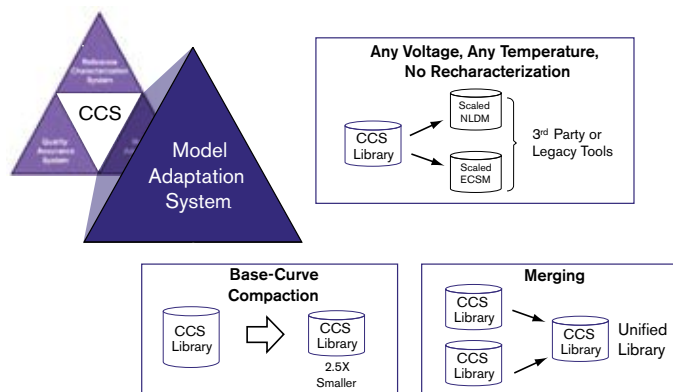


Figure 4: Model adaptation system

Model Adaptation System

Liberty NCX helps design teams minimize characterization overhead cost and enables them to support design implementation and sign-off in a wide range of voltage, temperature and process conditions. Starting with a minimum set of reference CCS library corners, this system allows designer to scale libraries for any voltage or temperature and generate third-party current-source models or legacy NLDM formats. The model adaptation system takes advantage of base-curve compaction, reducing the open-source ASCII CCS library file size about 2.5 times to reduce storage and distribution cost. These capabilities give design teams unsurpassed flexibility in supporting various design styles and tool flows while minimizing library characterization and storage costs.

Supported Library Views

- Latest Liberty open-source features approved by the Liberty TAB
- Composite Current Source (CCS)
 - CCS timing
 - CCS noise
 - CCS power
 - CCS variation-aware

- Non-Linear Delay Models (NLDM)
- Non-Linear Power Models (NLPM)
- Effective Current-Source Models (ECSM)

Key Features

- High performance via adaptive, fine-grain simulation job parallelization and HSPICE client-server support
- Dynamic waveform segmentation and simulation setting adjustments
- Intuitive, easy-to-use interface
- Interdependent setup and hold characterization
- Variation-aware (statistical) characterization
- Automated index point selection
- Native base-curve compaction support

Supported Platforms

- Sun Solaris
- Linux Red Hat, 32- & 64-Bit
- SUSE

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