The Cadence® Virtuoso® custom design platform L represents the entry-level configuration of the industry’s leading design system for complete front-to-back analog, RF, mixed-signal, and custom digital design. It delivers a number of updated capabilities and design flow enhancements that offer solutions for all common custom IC design requirements.

THE VIRTUOSO CUSTOM DESIGN PLATFORM

When design objectives dictate manipulating precise analog quantities—voltages, currents, charges, and continuous ratios of parameter values such as resistance and capacitance—companies turn to custom design. Full-custom design maximizes performance while minimizing area and power. However, it requires significant handcrafting by a select set of engineers with very high skill levels. In addition, custom analog circuits are more sensitive to physical effects, which are exacerbated at new, nanometer process nodes.

The Virtuoso custom design platform accelerates the design of custom ICs across various process nodes. By selectively automating aspects of custom analog design and providing advanced technologies integrated on a common database, it allows engineers to focus on precision crafting their designs—without sacrificing creativity to repetitive manual tasks.

Figure 1: All components of the Virtuoso platform work together to support fast, silicon-accurate differentiated custom silicon
VIRTUOSO CUSTOM DESIGN PLATFORM L

Virtuoso custom design platform L delivers entry-level design creation and implementation capabilities updated with productivity enhancements for design composition, simulation, and physical design. New features and improvements enable designers to achieve fast, silicon accurate designs—even at the new, smaller process nodes. It includes Virtuoso Schematic Editor L for design entry, Virtuoso Analog Design Environment L for full simulation and analysis of design, and Virtuoso Layout Suite L for accelerated physical layout.

BENEFITS

- Reduced learning curve via a unified design environment for both front-end and back-end designs
- Easy visualization of large, complex designs
- Speed improvements in design entry, visualization, access, and control
- Accelerated debug process using a variety of built-in analog analysis tools
- Quick detection of circuit problems via an intuitive, easy-to-use visualization cockpit
- Increased productivity and design quality

FEATURES

VIRTUOSO SCHEMATIC EDITOR L

Fast and Accurate Design Entry

The Virtuoso Schematic Editor L provides numerous capabilities to facilitate fast and easy design entry. These include well-defined component libraries that allow faster design at both the gate and transistor levels. Sophisticated wire routing capabilities further assist in connecting devices. For larger and more complex designs, Schematic Editor L not only supports multi-sheet designs but also provides the ability to design hierarchically, with no limit on the number of levels used. The Hierarchy Editor makes hierarchical designs easy to traverse, and Virtuoso Schematic Editor L automatically ensures all connections are maintained accurately throughout the design (see Figure 2).

Design with Industry-Standard Languages

Virtuoso Schematic Editor L is well suited for entering mixed-level designs, using descriptions based on the industry’s two leading hardware description languages—VHDL and Verilog® HDL. To provide a standard method for entering designs, regardless of design type, it also supports the use of Verilog-AMS and VHDL-AMS mixed-signal languages. In addition to entering the languages, users can generate block representations from the HDL descriptions automatically, facilitating a system-level approach to IC design.

Extensive Design Checking Capabilities

To ensure the accuracy of designs, user-configurable rule checks identify drawing and electrical rule violations, such as overlapping components, open or shorted connections, unconnected inputs and outputs, object consistency, and illegal names. This capability allows a designer to check connections throughout the entire design hierarchy for pin name matches, completion of wire connections, and proper wire labeling. It also provides flexibility to check individual pages of the design, or check the entire design hierarchy with one command.

VIRTUOSO ANALOG DESIGN ENVIRONMENT L

Easy-to-use Interactive Design and Simulation Environment

The interactive environment provides everything required to set-up, run, and analyze the results from Virtuoso Multi-Mode Simulation. The Virtuoso Analog Design Environment L includes a variety of capabilities for displaying and analyzing results. This environment affords designers the flexibility to visualize and understand the many interdependencies of an analog, RF, or mixed-signal design, making it possible to quickly and easily pinpoint critical design parameters and their effect on circuit performance. The flexible environment allows designers to take advantage of Virtuoso Multi-Mode Simulation as well as switching between different simulators without having to reset all measurements (see Figure 3).

Built-in Waveform Display and Signal Analysis Capabilities

The waveform display feature, coupled with an extensive waveform calculator, provides a comprehensive post-simulation analysis environment. The waveform window can handle all types of analog and digital signals. It supports multiple data channels, each with independent scaling and offset settings, allowing for detailed analysis of complex waveforms. The signal analysis capabilities include fast Fourier transforms (FFT), spectrum analysis, and power spectral density (PSD) analysis, enabling designers to quickly identify and isolate signal anomalies. The waveform display also includes powerful data measurement tools, such as peak/average power, frequency, and period analysis, which are essential for verifying design performance against specifications.

Figure 2: Virtuoso Schematic Editor L
mixed-signal data, including advanced displays such as noise, corner, statistical and RF plots. Additionally, it contains a variety of changeable display attributes for the axes, waveform colors, and labels, which allows designers to create professional plots for

reports. Waveform markers and the built-in waveform calculator allow accurate measurement of signals in a variety of different modes, including transient, AC, and RF. The calculator's algebraic expressions can be composed of any combination of input or output voltages, or currents.

**Bridging the Gap Between Schematic and Physical Design**

The Virtuoso Analog Design Environment L provides a simulation environment where the designer can compare designs in both pre- and post-extracted forms. This capability bridges the gap between schematic design and physical layout by completing the front-to-back IC design flow.

**VIRTUOSO LAYOUT SUITE L**

**Fully Hierarchical, Multi-Window Editing Environment**

Virtuoso Layout Suite L offers users the ability to open multiple cells or blocks in any single editing session—or different views of the same design—helping designers ensure consistency in complex designs. The integrated World Viewer is an intuitive navigational aid within the product that helps locate zoomed-in areas of detail within the context of the overall design. Performance optimized selection, zooming, redraw and other commonly used commands increase layout productivity (see Figure 4).

**Flexible Parameterized Cells Reduce Design Entry Time and Design Rule Violations**

Parameterized cells (Pcells) provide an advanced level of design automation to minimize tedious and repetitive layout tasks. Pcells make it possible to change the size, shape, or contents of each cell instance, without changing the original cell. They also raise the level of abstraction to the component level, which accelerates layout tasks and reduces design violations by simplifying complex shapes and devices that can be generated, edited and managed with variable settings.

**Automated Menu-Driven Device Generation with QuickCell**

Virtuoso Layout Suite L accelerates the creation and editing of devices with the use of the QuickCell (QCells) menu-driven parameterized cell feature. The QCell
feature simplifies the installation, creation and editing of devices by eliminating the need for SKILL programming of parameterized (Pcells). QCells are also ‘C’ based, which improves tool performance. SKILL programmable Pcells are an option and compatible with Qcells.

Design-Rule–Driven Functions for Improved Productivity

Virtuoso Layout Suite provides design-rule-driven features that are automatically flagged when in violation or enforced in real time. This promotes correct-by-construction layout to improve productivity and reduce physical verification iterations and time. All technology file process rules are supported, including complex 90 nanometer nodes and below.

Advanced Layout Automation Simplifies and Optimizes Block Authoring

Virtuoso Layout Suite simplifies and optimizes block authoring with advanced layout automation features that leverage the Layout Suite’s design-rule-driven functions and flow. Dynamic Measurement minimizes the need to manually measure geometries. Alignment speeds the task of aligning instances, pins, and objects. Mark Net efficiently traverses the physical design hierarchy and performs continuity checking and highlighting. And the Point-To-Point router efficiently creates and edits the design interconnect.

VIRTUOSO SCHEMATIC EDITOR L

Design Composition

• Complete design hierarchy support
• Simplified automatic generation of an HDL template
• Support of multi-sheet schematics
• User-configurable command bindkeys and label display
• Dynamic highlighting for easy design correction
• Automated interactive connection router
• User-configurable selection with filtering
• Comprehensive symbol creation and editing features
• User-configurable undo/redo levels

VIRTUOSO ANALOG DESIGN ENVIRONMENT L

Interactive Simulation Environment

• Reuse of simulation set-ups
• Cross-probing support for both schematics and layouts
• Design variable support
• Auto-plotting and printing of simulation data
• Batch scripting
• Schematic annotation of node voltages and device information

Waveform Display

• Support for multiple Y-axes, strip plots and Smith Charts
• Built-in waveform calculator
• Independent sub-window displays
• Horizontal and vertical measurement markers
• Independent pan and zoom capability
• User-defined labels and titles
• Color and line style controls
• Signal browser

Distributed Processing

• Distribution of multiple simulations
• Efficient use of existing computer farms
• Built-in basic load balancing or interface to other LSF load balancing tools
• Job monitoring and controlling functions
• Graphical user interfaces for setup and viewing status

Design Inputs

• OpenAccess data objects
• Circuit design language (CDL)
• SPICE

Design Outputs

• SPICE
• PSF waveform format
• SST2 waveform format
• Cadence SKILL

VIRTUOSO LAYOUT SUITE L

Layout Creation and Editing

• Menu-driven QCell or SKILL programmable automated device generation
• Design-rule-driven editing with real-time notification or enforcement of process rules
• Dynamic measurement
• Point-to-point interactive router
• Automated alignment feature
• Mark Net continuity checking and highlighting
• Graphical library browser
• Unlimited design hierarchy support
• Multi-window editing supporting on the same or different design data
• Pre- and post-selection modes
• Create and edit polygons, paths, rectangles, circles, ellipses, donuts, pins, and contacts in layout cell views
• Comprehensive search and replace features
• Pcell support for changing the size, shape, or contents of each cell instance without changing the original cell
• Customizable tool environment using Cadence SKILL programming language
• World viewer

Design Inputs
• SKILL
• STREAM format
• OpenAccess database

Design Outputs
• SKILL
• STREAM format
• OpenAccess database

Platform/OS
• Sun/Solaris
• HP-UX
• IBM AIX
• Linux

THIRD-PARTY SUPPORT
• Process design kits
• Virtuoso Analog Design Environment: Interfaces to commercial circuit simulators are available, including Synopsys Hspice, Mentor Graphics Eldo, Silvaco SmartSpice and Agilent ADS. In addition, software is available to integrate proprietary circuit simulators
• Virtuoso Layout Suite and Virtuoso Schematic Editor: SKILL-based and OpenAccess tools and functions

VIRTUOSO CUSTOM DESIGN PLATFORM L FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Virtuoso Schematic Editor L</th>
<th>Virtuoso Analog Design Environment L</th>
<th>Virtuoso Layout Suite L</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Common Cockpit</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>New Icon Style</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Multi-Tab Support</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bookmarks &amp; History</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Updated Pulldown Menus</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Window Config Support</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>World View Assistant</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Search Assistant</td>
<td>X</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>Property Editor Assistant</td>
<td>X</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>Single Testbench</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Simple Parametric Analysis</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Device Checking</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Global Variable Support</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Updated Wavescan</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>New Calculator</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Simulation Support: Virtuoso Multi-Mode Simulation, HSPICE</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Basic Polygon Editing</td>
<td>x</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>QCells</td>
<td>X</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>DRD Editing</td>
<td>X</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>Constraint Browser</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Search Assistant</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Property Editor Assistant</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

CADENCE SERVICES AND SUPPORT

• Customer-focused solutions that increase ROI, reduce risk, and achieve your design goals faster
  – Collaborative approach and design infrastructure—virtual teaming
  – Proven methodology and flow tuned to your design environment
  – Design and EDA implementation expertise

• Product and flow training to fit your needs and preferred learning style
  – Over 80 instructor-led courses—certified instructors, real-world experience
  – More than 25 Internet Learning Series (iLS) online courses

• Cadence customer support that keeps your design team productive
  – Cadence applications engineers provide technical assistance
  – SourceLink® online support gives you access to software updates, technical documentation, and more—24 hours a day, 7 days a week

For more information
Email us at info@cadence.com
or log on to www.cadence.com