

## TowerJazz and Cadence

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Robert Milkovits, Director of Customer Design Support, TowerJazz

### The Customer

TowerJazz is a specialty foundry that manufactures integrated circuits (ICs) for more than 150 customers worldwide. The company offers specialty CMOS and digital CMOS process technologies with geometries ranging from 1.0 to 0.13 micron. The specialty offerings cover a wide breadth of applications, like the high-voltage TS18PM or the high-frequency SBC18 270GHz Silicon Germanium BiCMOS.

The company also provides foundry microelectromechanical systems (MEMS)-enablement solutions combined with high-volume 150mm and 200mm CMOS wafer manufacturing.

The TowerJazz Customer Design Support team works with customers to answer their design tool and flow questions, select the best technologies, and understand process design kit (PDK) functionalities so that customers can successfully design their products. Robert Milkovits, Director of Customer Design Support, leads this team and is also an architect for TowerJazz PDKs and electronic design automation (EDA) tool flows.

### The Challenge

TowerJazz first began working with Cadence as a foundry partner in 2002 to enhance product differentiation and customization for its customers’ analog and mixed-signal specialty products.

“Because of our focus on specialty products, we must offer tools and flexibility that wouldn’t be found in a standard digital CMOS flow,” Milkovits explains. “We needed to give our customers a solid tool flow so they could get to market quickly, with minimum interruptions.”

### Business Challenges

- Time-to-market pressures
- Rising development costs

### Design Challenge

- Product differentiation and customization for analog and mixed-signal specialty products

### Cadence Solutions

- Virtuoso unified custom/analog flow
- Virtuoso Schematic Editor
- Virtuoso Analog Design Environment
- Virtuoso Space-Based Router
- Cadence QRC Extraction
- Cadence Services

### Results

- Complete, customized offerings with a wide array of tools and functions
- Lower development costs
- Faster time to market

## The Solution

TowerJazz selected the Cadence® Virtuoso® unified custom/analog flow to automate certain aspects of custom IC design for its customers. Using selective automation during custom IC design allows engineers to focus on the important business of differentiating their designs. Virtuoso Schematic Editor, the Cadence circuit design solution, enables fast and accurate entry of design concepts—and it manages design intent.

Cadence also offers an advanced design environment that allows designers to characterize, visualize, and understand the many interdependencies of an analog, RF, or mixed-signal design and their effects on circuit performance. Highly integrated mixed-signal designs can be difficult to simulate correctly due to the relationship between digital control circuitry and analog blocks. The Virtuoso platform enables co-simulation of digital and analog blocks, which is vital to evaluating digital-analog interaction and validating the functionality of the design.

“We need to offer highly accurate models for our customers in the RF market space,” Milkovits says. “We add functionality and flexibility to Cadence SKILL-based PDKs to give customers a complete, customized package. Our goal is to enable as many tools and functions as possible for our customers.”

For example, a customer with a large design team may require Virtuoso Space-Based Router functionality for custom place-and-route. So TowerJazz adds features to support Cadence place-and-route tools in the PDK. Or, if a customer needs capabilities for electrical and statistical analysis, verification, and optimization of analog/mixed-signal designs, TowerJazz includes support in the PDK for Virtuoso Analog Design Environment (ADE).

*“Together with Cadence, we’re accomplishing our mission to lower development costs and get to market faster.”*

“Virtuoso ADE is particularly powerful to our customers because they can set up a variety of testbenches and do a Monte Carlo analysis looking for design sensitivities,” Milkovits says. “The tool gives them a clear picture of what circuit device behavior will be so they can create designs that function robustly across variations in the manufacturing process. After customers run the simulation they can see how it ties to the manufacturing process and then tune for circuit sensitivity without overdesigning.”

Across the board, TowerJazz PDKs, which draw upon Cadence technology, enable high-level functionality and tools. Because the tools have already been validated, customer design teams enjoy faster access to these functionalities.

TowerJazz partners with Cadence because it provides “a complete mixed-signal design solution—a single vendor for everything from schematic to verification to layout to extraction to digital flow,” Milkovits says. “In addition, Cadence is the mixed-signal industry leader, which provides us with access to the best technology and the largest design ecosystem.”

Cadence also offers mature and production-proven technologies. One example is Cadence QRC Extraction, which performs efficient, accurate parasitic extraction on mainstream and advanced-node designs to speed convergence on design goals.

“With QRC Extraction, our customers get accurate extraction, including high-frequency effects, within an easy timeframe,” Milkovits says. “There’s a very well-thought-out flow that also allows them to include digital logic into specialty products. A customer can pull digital control logic easily into an analog design and use a tried-and-true flow to validate the design with assurance. Other tool vendors don’t offer this trusted flow.”

A key benefit is the consistency of this flow from one stage of design to the next. The Virtuoso platform provides a unified interface for creating and reviewing the design, starting from the schematic, through simulation in Virtuoso ADE, and then through creation and simulation of extracted simulation views using QRC Extraction. Designers can use additional features in ADE to automate the comparison of design behavior along these different design stages; for example, evaluating how the design behaves when parasitics are included or different simulation model corners or control conditions are considered. This consistency of the flow helps design teams be more efficient while improving accuracy with technologies such as QRC Extraction.

TowerJazz also finds special value in Cadence Services. Cadence Services has created several advanced analog IP blocks, like ADCs and DACs, which TowerJazz offers to their customers. The two companies have also partnered to provide design services to mutual customers, allowing customers to leverage Cadence Services together with TowerJazz manufacturing expertise.

## Summary

Cadence has helped TowerJazz adopt a mixed-signal design flow that enables an extremely efficient design cycle. Used in combination with TowerJazz PDKs, customers get the unique design tools and services they need.

TowerJazz plans to continue working with Cadence to help its customers take advantage of new custom IC design technologies and to support them as they migrate from the Virtuoso 5.1 to the Virtuoso 6.1 environment. Simultaneously, TowerJazz will be working on its next-generation PDKs. “We see great features in Virtuoso 6.1 and we look forward to offering these benefits to our customers,” Milkovits says.

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