



CADENCE AND CRAY INC.

Cray Dramatically Accelerates Design Schedule Using Cadence Virtuoso Layout Migrate Solution

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Joel Ficke, Senior Circuit Engineer, Cray Inc.

CORPORATE PROFILE

- Cray is the global leader in supercomputers, specializing in systems purpose-built to deliver exceptional sustained application performance and scalability

DESIGN CHALLENGE

- Migrate full-custom layouts for five 90nm memory arrays
- Layout 1000+ cell library elements

CADENCE SOLUTION

- Implemented Virtuoso® Layout Migrate software
- Worked with the design team to enable rapid layout migration, resulting in a six-month reduction in the design schedule

CADENCE PRODUCTS AND SERVICES

- Virtuoso Layout Migrate physical layout migration software
- Cadence Engineering Services

UNWAVERING FOCUS ON HIGH-PERFORMANCE COMPUTING

Headquartered in Seattle, Washington, Cray Inc. is a company that is instantly identifiable with its market. As the pioneer and global leader in supercomputers, Cray continues to push the technology envelope, developing innovative computing platforms for the most complex computational challenges in academia, government and industry.

Cray's next-generation supercomputer, code named "Black Widow," is expected to achieve record peak performance. The project presented a significant design and schedule challenge. "Cray has a culture of pushing technology, and the Black Widow project is no exception," said Dave Kiefer, Cray vice president of engineering. "When you push the envelope as hard as we do, you're going to run into challenges that look like show-stoppers. That's where strong relationships with partners like Cadence make a real difference."

SO MUCH TO MIGRATE, SO LITTLE TIME

Cray and Cadence had been working together on the Black Widow design for eight months. Cray was in the process of tackling the labor-intensive task of custom layout, placement, and routing for five memory arrays when the decision was made to migrate the design to Texas Instruments' latest 90nm process technology. "This decision created a major disruption in our process and threatened our schedule," said Joel Ficke, senior circuit engineer, Cray. "We realized that there was no way we would have enough time to lay out the memory blocks by hand again. We needed to find a new way to handle this issue and recover as much time in the schedule as we possibly could. The Cadence team suggested that the Virtuoso Layout Migrate solution might be the answer we were looking for. They were right."

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CADENCE AND CRAY – A SHARED DEDICATION

"Cadence has been responsive to our changing needs," said Kiefer. "We try to estimate as best we can with tasks that we've assigned, but if something changes or didn't go as we thought and we determine that we need more resources, they're there for us. In fact, there has never been a request for help that's been denied in any way."

"Working with Cadence Engineering Services is like having a virtual extension of your own team," said Ficke. "They take ownership for their work, and put in whatever hours it takes to achieve the quality they demand. It would not be uncommon to see these guys working long hours right along with the rest of us."

LEVERAGING THE VALUE OF CADENCE ENGINEERING SERVICES

Cray has been working with Cadence Engineering Services for some time, and plans to continue. "A big value of this model is that we get instant resources and instant expertise, when we need it," said Kiefer. "From an economic standpoint, it makes a lot of sense to leverage Cadence Engineering Services for specialized tasks like this one."

BALANCING AUTOMATION WITH MANUAL EFFORTS TO ACHIEVE MAXIMUM TIME SAVINGS

To maximize the power of the Virtuoso Layout Migrate software, the Cray team opted to have Cadence manage that portion of the migration task. "This is very complex software, and we needed an expert in the driver's seat," said Ficke. The goal for using the tool was to minimize the amount of manual work that would need to be done, but the team knew that it would not be a completely automated process. "Essentially, we combined the core strengths of the Virtuoso Layout Migrate solution with the expertise of the layout team. The software got us most of the way there on the memory arrays, past the 90% mark, and then we fixed up the rest manually. I think that turned out to be the biggest overall time saver.

"A key feature of the Virtuoso Layout Migrate solution is how it handles memory during migration," continued Ficke. "Memory is composed of lots of smaller sub-cells, and the tool migrates those sub-cells while keeping an eye on the overall architecture of the memory. It looks at the cell, understands how

the cell connects at the next level of hierarchy, and then migrates the whole thing while preserving the subset. That's a complicated problem that we were able to solve in a fairly automated fashion using this new process."

VIRTUOSO LAYOUT MIGRATE SOFTWARE NOT ONLY SAVES SCHEDULE, IT ACCELERATES IT

In addition to the five memory arrays in the design, the team needed to migrate the layout for 1000+ cell-library elements. "We hadn't expected the Virtuoso Layout Migrate solution to work for cell migration when we went into the project," continued Ficke. "That was a real surprise. We got our entire library back in a week and it just needed a bit of touch-up. That task alone would have taken us three months to do by hand. In addition, we were able to get five memory arrays through, saving one to three man-months per array."

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