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Shaving Weeks Off PCB Design Cycle Via Auto-Routing

Polycom and Cadence

The Customer

Founded in 1990 and headquartered in San Jose, California, Polycom helps organizations unleash the power of human collaboration. More than 400,000 companies and institutions worldwide defy distance with secure video, voice, and content solutions from Polycom to increase productivity, speed time to market, provide better customer service, expand education, and save lives.

Greg Rousch, one of the company's engineering managers, heads a team that develops the hardware for video conferencing and conference room phones.

Key Challenges

For years, Rousch's team had been manually routing the PCB boards that go into Polycom's conferencing phones. The team also lacked an effective design constraint capture capability. Explained Rousch, "Our circuit designer would write down a list of layout instructions containing loose guidance of what the layout guy was supposed to do, without rigorous design constraints. We develop complex boards, with as many as 18 layers and thousands of nets. These boards took quite a while to route by hand. Frequently, we would get to the last five percent of nets and have problems closing the routing."

Along with this process came doubts around the signal integrity of the designs. Signoff on a layout was a very manual process, with the engineers wading through thousands of nets to make sure they were following certain design rules. "We were always worried we'd miss things," said Rousch.

To keep up with product refresh cycles as well as quality expectations, the team decided it was time to move to auto-routing of their PCB boards.

The Solution and Results

Polycom is a long-time Cadence® customer, using tools including OrCAD® Capture CIS for schematic design entry and synchronization/validation of parts data and Allegro® PCB Designer for constraint-driven design. In their search for an auto-routing tool, Rousch and his team simply asked their Cadence representative, who turned the team on to DFM, a Cadence PCB design services bureau. The DFM consultant helped the team improve its design constraint process and skills and also suggested Allegro PCB Router for auto-routing.

"With auto-routing, we certainly got through routing quicker, and spent more time upfront entering design constraints and doing the process of correct-by-construction," said Rousch. "Allegro PCB Router helped us shave off a few weeks of

Challenges

- Automate PCB design routing for faster time to market
- Continually enhance quality of PCB designs
- Identify more detailed design constraints

Cadence Solution

- Allegro PCB Router
- Allegro PCB Designer
- OrCAD Capture CIS

Lessons Learned

- Spend more upfront time capturing design intent
- Have design constraints in place before placing the board

Results

- 10% faster time to market for boards, with 25% faster PCB design cycle
- $50K saved annually through greater layout design efficiencies, which eliminates need to hire outside layout staff during busy cycles
- Ability to perform "what if" analysis, resulting in better quality boards
- Achieving higher quality avoids the tens of thousands of dollars that could be spent in the event of a respin
- Better alignment between industrial and mechanical design phases contributes to better product quality

overall cycle time. This is critical in getting our boards to the lab, finding bugs, and shipping our boards—all of which we can now do earlier."

In addition, Polycom also enhanced the quality of its PCB designs. "Auto-routing took away the worries. Before we release a design, we can run reports in Allegro PCB Router with exact checks against our design constraints, and flag any parameters that haven't been met. As a manager, that made me feel way better—that we're not missing anything," said Rousch.

Initially, the team—deeply experienced in PCB design and accustomed to manual routing—was a bit hesitant to move to auto-routing. But seeing the quality of signals on the oscilloscope convinced even the die-hards that auto-routing saves time and contributes to better design quality.

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>
> *Greg Rousch*
> *Engineering Manager, Polycom*

Jim Klecka, a senior engineer on the team, notes, "Now we typically get our placements in and spend a week doing test routes. Once we have a route that looks pretty good, we can typically finish a week or so later."

The Polycom team works on some fairly dense PCB designs, where at times there's a question of whether a particular design can be routed at all. "With Allegro PCB Router, we can now do many different auto-routes on different layers, which helps us drive product implementation and assess feasibility of our proposed designs."

With the increased productivity thanks to auto-routing, the Polycom team is saving the costs of hiring external layout engineers during particularly busy times. Its internal layout team can also start new projects earlier. What's more, by getting PCB designs right the first time, the team also avoids the tens of thousands of dollars that can be wasted if a design respin is required.

Polycom's portfolio includes products that are cost-sensitive and produced in high volume, so it's important for the PCB design team to minimize the number of layers used on their boards. Notes Rousch, "Allegro PCB Router lets us quickly route a board and decide which combination of technologies and number of layers best suits the end product."

Lessons Learned

In moving from manual to auto-routing, the Polycom team gained insights that can help make such a process smoother. One key lesson is to spend much more time methodically capturing detailed design intent upfront. Another is to ensure that the design constraints are in place before placing the board. The industrial design process places pressure on PCB design, often creating pressure to do placement without design constraints. To close the gap between industrial design and mechanical design, the team learned that it was advantageous to have, at the very least, the initial capture of schematics and constraints so that the circuit board designer could do floorplanning in parallel with industrial design.

"Allegro PCB Router enabled us to perform "what if" analysis early on in our process, so we were able to move circuit board layout up in our cycle to line up more closely with industrial and mechanical design," explained Rousch. "We can move connectors around, and assess how it might work for the end user. We can slide things around on the edge of the board without fear that it will mean extra work at the end or impact our schedule. We get a much better end product as a result."

Summary

Looking ahead, as its technologies continue to evolve, the Polycom team will continue to keep an eye on add-on tools in the Allegro suite. "We were already well entrenched with Cadence layout tools, so we were not looking to change vendors when we sought an auto-routing tool," said Rousch. "The quality of Cadence's Allegro tools and its PCB service bureaus, like DFM, gave us the confidence that we really didn't have to look elsewhere."