Motorola SPS

Sagantec technology automates physical migration of full custom processor core

Corporate Profile
Provides embedded processors for smart products

Business Challenge
Leverage design reuse to boost productivity, speed time to market

Objective
Replace manual migration with automated flows

Results
Achieved seven-fold improvement in productivity for layout migration

When it looked to migrate the Motorola M*CORE® processor core to its high-performance HiP7® (0.18 micron generation) technology, the Embedded Platform Solutions group of Motorola SPS turned to Sagantec to provide the missing link in a new automated work flow. With Sagantec tools, the Motorola team was able to complete migration design requirement seven times faster and with fewer iterations than required with its earlier manual workflow. What's more, Motorola managers anticipate a 14-fold productivity increase in subsequent designs that leverage the experience from this project. By automating critical physical migration tasks, Sagantec technology helped Motorola SPS speed delivery of its M*CORE processor core in its new high-performance process technology.

Motorola Embedded Platform Solutions
The world's number 1 producer of embedded processors, Motorola's Semiconductor Products Sector helps its customers create smart products and exploit new business opportunities in the networking and computing, wireless communications, transportation and digital consumer/home networking markets. With worldwide sales totaled $7.9 billion in 2000, Motorola SPS employs approximately 30,000 people at manufac.turing facilities, major laboratories, technology and design centers and sales offices around the globe.

Motorola's SPS M*CORE is an ultra-low-power, high-performance embedded core designed for portable applications including digital phones, pagers, personal assistants and automotive products such as braking systems and engine control. To meet the high performance requirements of its target applications, Motorola engineers implemented the M*CORE datapath in a full-custom design. When Motorola SPS decided to migrate the existing HiP6W® (0.25 micron generation) M*CORE to the new HiP7 process, the Motorola design team decided to retarget the existing full-custom HiP6W datapath layout rather than embark on a complete physical redesign.

Project Goals
Full-custom design requires a broad array of physical design information to meet aggressive performance criteria. When they need to apply this information for a new submicron process technology, engineers have faced a daunting task dominated by manual schematic and layout edits.

"In the past, retargeting a full-custom layout to a new technology has been a mostly manual and very costly process," said Ravi Vaidyanathan, Motorola SPS Design Engineer. "For migrating the M*CORE design, however, we decided to employ an automated flow using tools from Sagantec and other vendors."

sagantec

Full Custom Fast

Motorola SPS

For the Motorola design team, the new flow would need to draw on multiple vendors' tools to handle the details of physical migration. To accomplish the task, the engineering team looked to a simple flow, including an initial forward-annotation set-up and with a circuit optimization and a physical migration loop (figure 1).

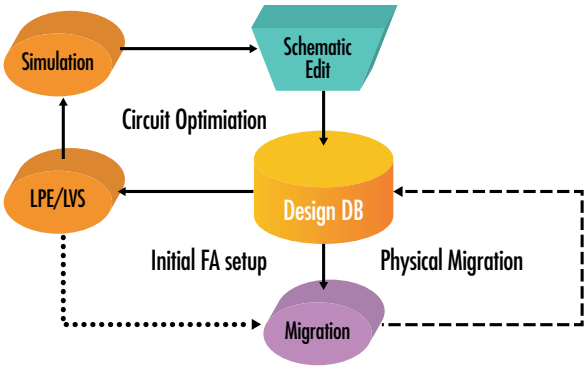

Figure 1. Retargeting Flow Design

In this flow, forward annotation set-up used LVS (layout vs. schematic) to establish the names, dimensions, and x,y-coordinates of each device in the original design. In circuit optimization, the engineering team used layout parasitic extraction and simulation, combined with designer analysis and schematic edits to retarget device dimensions. The physical migration loop combined the initial set-up information with optimized channel widths and lengths to convert the forward-annotated layout to the target design rules. With successive iterations of circuit optimization and physical migration, the team could achieve the performance criteria.

The Challenge

In the physical migration of the full-custom datapath, the M*CORE team needed tools able to deal with design rule changes including new widths, spaces and metal orientations. Indeed, physical migration would result in MOSFET changes that needed to be optimized. Still, the migration would retain the datapath's existing floorplan so that the relative placements and orientations of the devices and hierarchical design blocks would not need to be changed.

The Results

"For physical migration, we relied on Sagantec's Hurricane to automate the physical migration phase of the process," said Vaidyanathan. "Embedded in an automated flow with other third-party tools, Hurricane helped our team to complete the retargeting flow in only two iterations over just a two-week period."

Sagantec's distributed processing technology in Hurricane also helped ensure short run times. The M*CORE migration team divided the schematic and layout for the datapath into 16 sections such as the adder, address generator, and multiplier, to simplify parasitic extraction and simulation. In turn, Hurricane utilized these block divisions to multiplex the migration job, seamlessly assembling the components back together upon completion. Most important, by automatically handling physical resizing and optimization, Sagantec technology helped the Motorola SPS team meet its requirement for a more efficient process.

"By essentially eliminating manual layout rework, Sagantec's tools present a time and resource savings," said Vaidyanathan. "That makes Sagantec's approach attractive for other full- and semi-custom applications."

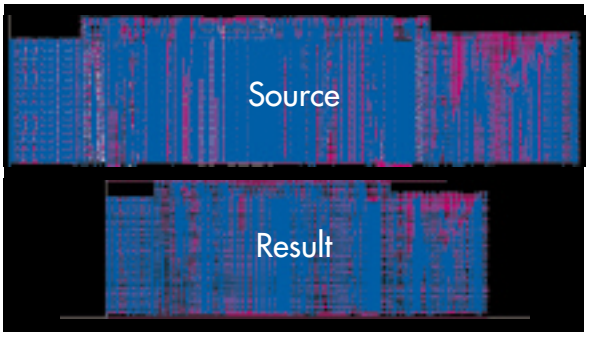

Figure 2. Layout Source and Result

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