How Wipro helped develop a ‘one of its kind’ advanced accelerator for the PC entertainment market

Wipro recently helped one of its clients realize a unique solution targeted at PC-based entertainment market. The solution involved

- A PC-based accelerator card with a high-performance ASIC
- A software suite with algorithms optimized for the ASIC

With architecture optimized for multi-threaded processing, the solution delivers the processing power to simulate real-time interactive worlds, and enables creation of smooth and detailed simulation of movements, fluids, water, hair and collisions.

The Client

A US-based fabless semiconductor start-up that delivers interactive reality to PC based entertainment.

Overview

The client’s role was the conceptualization and architecture of the solution. For this purpose, the client put together a team of architects, domain experts, software engineers & executives. They acquired the software suite from a European company, which was then optimized for the ASIC. They procured logic and silicon IP blocks from industry-standard vendors such as MIPS, Synopsys, Virage and ARM. Wipro’s engagement was to develop the ASIC and the reference card. The completed design was to be manufactured by TSMC.

The Challenges

1. Competing for Performance & Time

With industry heavy-weights already present in the fast-paced PC-based market and pushing hard, the processing solution needed to provide a substantial improvement in vector floating point processing performance over contemporary solutions. A large and complex ASIC was envisaged, to be implemented in 130 nm silicon technology to achieve the high performance required. Being the only product of the company, the ASIC had to work right the first time.

2. Large-scale Efforts

Apart from the task of preparing the first of its kind ASIC and its software suite, our client had to gain the support of content developers and create operations to deal with large volume production.

3. Diversified Development Ecosystem

Apart from micro-architecting and designing the core processor, external graphics DDR memory interface controller and data movement controller blocks from specifications, the development also required Wipro to work closely with external parties spread across the globe, like IP providers, ASIC manufacturing, packaging & test partners, and the client team, to ensure the completed product confirms to its specifications. A few IP blocks were still evolving, and adequate sensitivity and flexibility to adopt changes along the development, were required.

The Way Forward

Given the time to market constraints faced by the client, Wipro's VLSI/system design team had to move fast.

Team Ramp – up:

Wipro quickly put together a team of VLSI and board design engineers & resources for the ASIC development. Wipro team contained a project manager, expert VLSI designers as design leads, and experienced engineers as design implementers. Wipro team was located in Bangalore, India.

Product Development:

Wipro's involvement in ASIC development covered micro-architecture, support for custom package design, support for IP selection & integration, logic design and functional verification, system modeling, physical design, design for test, manufacturing test development and debug support, silicon validation, device characterization support and production support.

Reference Design Board:

Wipro also developed reference cards, helped with characterization & compliance testing, and supported handoff to the end-of-line testing at OEM manufacturers.

Validation:

Wipro's embedded software team helped with development of ASIC validation environment. This Windows-XP® based environment was used extensively for the silicon validation of the chip.

Success:

With nearly 300 man-months of effort, spread over close to 18 months, Wipro team delivered first-time-right ASIC and reference designs. Essentially, Wipro's project team helped client emerge with a solution that brings users close to reality in a virtual world. By offloading complex simulation processing tasks from the Central Processing Unit, the ASIC promises to be the biggest boon in PC entertainment after 3D graphics accelerators.

With a rich experience with complex ASIC and system development projects, a history of 100% first-pass silicon successes, strong design methodology and quality processes, Wipro ensured significant development time containment. With its product first demonstrated in March 2005 as planned, the product was launched in mass market later that year. Leveraging on the know-how further, Wipro team is currently engaged in developing the next-generation 90 nm ASIC for the client.

Business Benefits

1. Total Solution

Wipro was involved right from the idea stage till product realization. Designing not only the advanced ASIC – the heart of solution, but also the reference designs, employing it, and carried out functional validation of the hardware. Apart from this, Wipro also took care of prototype manufacturing, test and delivery of reference cards, and EMI/safety compliance certifications for many of the worldwide standards. Wipro also supported volume production of the ASIC of through ATE test development and debug support.

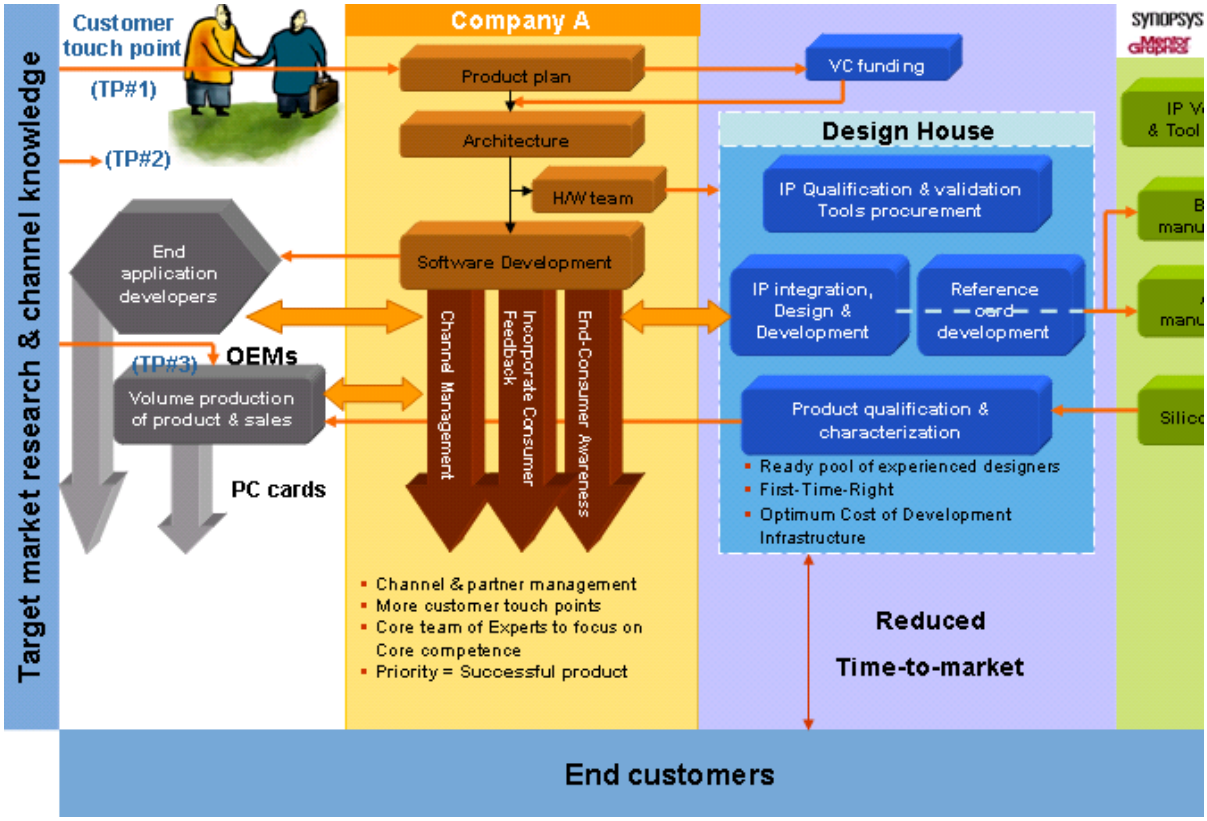

Fig: Enhanced Business Model

2. Allowed the client to focus on market development

Strong processes across all hardware development phases (ASIC & Board design, Proto manufacturing, Qualification & Compliance), along with attention of top management, enabled Wipro to take up hardware development effort for the client and allowed them to focus on software and market development.

3. First time right Solution

Wipro's ASIC, board, and environment software teams worked closely with the technical team of the client, fully understanding the requirements and delivered a high performance, optimized, first-time-right solution. The well-managed development allowed the client to meet their time-to-market requirements.

Technology Details

The ASIC is implemented in a high-performance 130 nm TSMC process, in a flip-chip BGA package. It operates at up to 400 MHz on interfaces and 333 MHz internally. The logic features multiple high-performance vector floating point processor cores, multi-channel DMA controllers and an efficient graphics DDR memory controller, plus PCI and PCI Express interfaces. The design employs logic and memory redundancy for higher yields than the manufacturing process allows.

There were significant challenges throughout development of the ASIC. A C++/SystemC based modeling approach was taken to allow simultaneous development of software environment. Dealing with evolving IP blocks and ensuring the correctness of third party IP blocks after integration was tough. Wipro's EagleWision

design methodology was employed for the ASIC design. The physical design of the chip involved complex floor planning to allow hierarchical flow, and often stretched EDA tools to their limits.

Wipro successfully overcame the challenges and the first-time-right product was delivered in little over a year, providing a cost-effective and time-effective development solution.

WIPRO IN VLSI/SYSTEM DESIGN

With 25 years of experience in electronic Hardware Design, Wipro understands what it takes to consistently deliver successful designs to customers. As the largest independent 3rd party R&D Service provider in the world, Wipro's 1700 hardware engineers along with 15000 software engineers provide complete product engineering solutions for customers meeting critical time-to-market demands of customers with design reliability, scalability and upgradeability.

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