

# Synopsys and Ricoh

## Ricoh Delivers Software 5 Months in Advance for New Multi-Function Printer with Synopsys Virtualizer



*Using Platform Architect™ MCO & Virtualizer™, we can build a virtual platform sooner, enabling architecture exploration, early software development and hardware performance verification at the highest level of the design phase for our SoC design.”*



**Satoshi Aoki**

Embedded Platform Development Department at Ricoh Company, Ltd.

### Business

Ricoh is a global technology company specializing in office imaging equipment, production print solutions, document management systems and IT services. Headquartered in Tokyo, Ricoh Group operates in more than 200 countries and regions.

### Challenges

- ▶ Deliver on time software for the next generation multi-function printer
- ▶ Improve software quality and performance
- ▶ Increase software developer debugging turnaround

### Synopsys Solution

- ▶ Synopsys Virtualizer™
- ▶ Synopsys ARM TLM Library
- ▶ CoStart Enablement Services

### Benefits

- ▶ Started software development 5 months ahead of the original schedule
- ▶ Reduced debugging turnaround time by 50%
- ▶ Reduced overall design and development effort by over 3 months
- ▶ Overall increased quality of developed software
- ▶ Provided a software development solution integrated within Ricoh's overall design and development environment

### Overview

Ricoh used Synopsys' Virtual Prototyping solutions to develop the software for a complex system on chip (SoC) targeted towards their next generation multi-function printer (MFP). The new design was based on a single chip derived from three previous distinct chips, creating complexities never faced before.

Based on a multicore ARM®-based architecture, Ricoh's goal was to design unique and competitive products and sought design and development tools to enable an agile design methodology capable of reacting to changes within their product specifications. In addition to their overall design goals, Ricoh desired independence from ASIC vendors to implement their own IP in both hardware and software, requiring a tight coordination between the teams involved in each stage of the development.

The use of Synopsys' Virtualizer™ resulted in the ability to start software development earlier, increase debugging turnaround and software quality, and integrate the virtual prototyping approach with architecture design and verification flows.

### Starting Early – Faster Debugging Turnaround

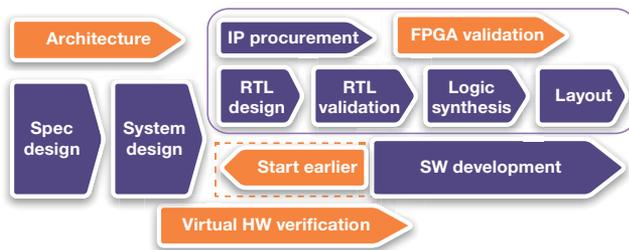
Ricoh knew that to meet their complex SoC design and software development goals, they needed to focus on multiple levels of the engineering effort. For

developers focused on OS porting, device driver and application software development, integration and test, the ability to start their design task well before the physical hardware availability was essential.

Using Synopsys' Virtualizer, the software development team was able to start their development 5 months in advance of the physical hardware availability. In addition, the advanced visibility and controllability enabled the team to reduce the debugging turnaround time. As with any design, the software debugging task is often an unknown trial and error process in advance of the defect being identified.

The use of the Synopsys tools provided a clear way to reduce the risk associated with this unpredictable task. With an early start and improved developer efficiency, the development teams were also able to allocate more time for testing, thus resulting in an overall improvement in the quality of the developed software.

## Staying Connected – Architecture and Software



Staying connected with evolving specification and design changes is critical to avoid diverging implementation between the SoC architecture and the software development. Ricoh knew that to meet their complex SoC design and software development goals, they needed to focus on multiple levels of the engineering effort.

From an architecture design perspective, understanding system performance early in development cycles would be critical to a successful end product. In addition, early software availability

was essential to validate decisions using real software before RTL was fixed.

The common modeling methodology and models provided by Synopsys' Platform Architect MCO and Virtualizer toolset enabled Ricoh to save over 3 months of effort on interconnect and memory subsystem optimization, hardware and software performance validation, system level verification of new IP, and software development. Even while managing new design challenges, such as architecture changes, image rendering performance, and software development for their IP, Ricoh increased their deployments and exceeded schedule goals.

Another key design task to be performed during the development of this complex SoC was to fully verify the functionality of Ricoh's custom SoC. Synopsys' VCS and ZeBu Server emulation environment integrated seamlessly with Synopsys' Virtualizer and Platform Architect MCO tools to achieve full verification of their design.

## Solution Completeness

Leveraging multiple integrated technologies to architect, design and verify Ricoh's complex chip was a key deciding factor for this project.

The completeness of the Synopsys product offering helped Ricoh reduce their schedule by 3 months. And when further assistance was needed, Synopsys' knowledgeable and responsive engineering support was ready to provide timely and knowledgeable help via CoStart Enablement Services, further easing the integration process.

"The quality of the Synopsys solution exceeded our expectations and the responsiveness and expertise of Synopsys' technical team was superb," said Naoya Morita, Embedded Platform Development Department at Ricoh. "We will consider Platform Architect MCO and Virtualizer for future projects with every confidence Synopsys will continue to meet our design and support requirements."

*"Synopsys Virtualizer enabled us to start the development of OS boot code and validation of driver software five months ahead of the original schedule."*

**Naoya Morita**

Embedded Platform Development Department at Ricoh Company, Ltd.