

# Synopsys and Ricoh

## Ricoh Optimizes New Multi-Function Printer SoC Architecture with Synopsys Platform Architect MCO



*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

- ▶ Predicting dynamic application performance earlier
- ▶ Optimizing the multicore SoC architecture to achieve the right balance of performance, power, and cost
- ▶ Avoiding over-design

### Synopsys Solution

- ▶ Synopsys Platform Architect™ MCO
- ▶ Synopsys ARM TLM Library
- ▶ CoStart Enablement Services

### Benefits

- ▶ Ability to model dynamic application performance with realistic workloads before software is available
- ▶ Highly accurate architecture models of the key SoC infrastructure IP provide deterministic measurements
- ▶ Visualization to observe system-level behavior to find problems earlier in the system design process
- ▶ Efficient simulation and analysis to optimize performance, power, and cost
- ▶ Clear analysis results to ease communication between architects and system designers

- ▶ More predictable and shorter development schedules for the hardware and software, reducing risk

### Overview

Ricoh used Synopsys' Architecture Design solution to design and optimize the multicore architecture 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.

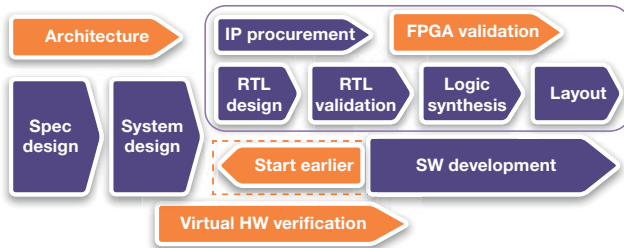
### Explore, Optimize, and Validate

The use of Synopsys' Platform Architect™ MCO provided Ricoh with the ability to analyze system performance and cost early in the development cycle, before application software was available. Its efficient turnaround time enabled the SoC

interconnect and memory subsystem configuration parameters to be explored against key system metrics and constraints much sooner.

As a result, the architecture team successfully identified problems earlier and fed them back to the hardware and software development teams. This prevented re-work of the design in later stages and ultimately reduced the length of the design process.

## 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 cycle would be critical to a successful end product. Through real simulation, Ricoh was able to create a performance model and optimize its configuration for performance and cost without over design and ultimately validate decisions using real software before RTL is fixed.

The combination of Synopsys' Platform Architect MCO and Virtualizer provided the foundation to achieve optimal design decisions in parallel with early software development.

The common modeling methodology and models provided by Synopsys' Platform Architect MCO and Virtualizer toolset enabled Ricoh to save 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' system-level design tools enabling complete 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 exceed 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 Platform Architect MCO provides powerful analysis to identify and resolve architecture bottlenecks sooner, enabling us to achieve the right balance of system performance and cost."*

**Naoya Morita**

Embedded Platform Development Department at Ricoh Company, Ltd.