Hybrid Software HELIX

ARRAY TECHNOLOGIES

By integrating Mako Core™ with the Apex renderer, Array Technologies overcame key performance challenges - improving efficiency and scalability, and strengthening its leadership in advertising and transactional printing, while enabling expansion into the brand-new market of high-speed color packaging.

The Challenge

As a developer of industrial inkjet solutions in mailroom automation and transactional printing where accuracy is non-negotiable, Array's print architecture requires real-time, random-access rendering, where any page from a variable-data PDF must be selected, rendered, and printed on demand at full press speed. Unlike sequential workflows, this model eliminates opportunities for pre-rendering, caching, or buffering, creating strict latency and throughput constraints. As production inkjet presses operate continuously, any rendering delay results in data underruns, press interruptions, or material waste.

The shift to full-color output further compounds the challenge by increasing computational complexity and data volumes, pushing traditional central processing unit (CPU)-based rendering architectures beyond sustainable performance limits.

The Solution

The traditional response to performance bottlenecks is to slow print speeds or invest in larger, more powerful servers with faster CPUs and additional memory - an expensive and inefficient option in a market

> " Render times have reduced by more than 50%, with the greatest benefits seen with complex four-color images. "

Joel Thomas, Vice President of Array Technologies.

that continually demands higher throughput. Instead, Array identified an opportunity to rethink its rendering architecture.

Array had already integrated the Mako Core print software development kit (SDK) into its Raptor Controller software that powers its range of inkjet presses for transactional printing.

Vice President of Array Joel Thomas, explains: "We have successfully used the Jaws RIP within Mako Core as part of our solution. As market demands continued to evolve toward higher-speed rendering performance, we were interested in exploring additional technologies that could further enhance throughput. When Helix introduced Mako with the graphics processing unit (GPU)-native Apex renderer, we recognized the potential performance gains it could deliver at a relatively low hardware cost."

Apex attracted particular attention because of its ability to scale color rendering efficiently. "Processing color data at very high speed is the real challenge," continued Thomas. "Once you solve that, you get all the benefits you already have for mono printing. Apex scales and handles complex color PDFs faster and more efficiently than our previous RIP."

Fast implementation and optimization
Array worked closely with Helix to integrate Apex into its Raptor Controller with a focus on the unique requirements of transactional printing. Helix provided guidance on best practices and helped identify where Apex would deliver the greatest performance gains. Leveraging its experience with Mako, Array selectively integrated the components it needed and refactored key parts of its system to suit its specific application.

Product manager for Mako Core David Stevenson notes: "Implementing Apex was fast because it is a renderer for the Mako Document Object Model (DOM), rather than a standalone PDF renderer. Array had already optimized how they prepared content with Mako in their Raptor Controller, which allowed them to switch to Apex efficiently."

" **Apex scales and handles complex color PDFs faster and more efficiently that our previous RIP.** "

Joel Thomas, Vice President of Array Technologies.

By integrating Apex, Array shifted rendering workloads from the CPU to the GPU. Rather than replacing existing systems, Array could leverage previously underutilized GPUs or add low-cost GPU hardware - an approach it ultimately adopted.

The result

The result is a substantial performance increase without expensive infrastructure upgrades, with rendering times reduced by more than 50%, and with the greatest benefits seen with complex four-color images. Beyond raw speed, the move to GPU rendering improved overall system efficiency, freeing CPU resources for other critical tasks and simplifying optimization across the platform.

Apex also enabled Array to differentiate itself in the market. Now, the Raptor Controller is the first in its class to introduce GPU-based rendering, delivering higher-volume transactional printing while maintaining accuracy and reliability.

Entering new markets
But the story doesn't end there. The impact of Apex extends beyond transactional printing. With GPU rendering in place, Array identified a new opportunity in variable box (case) printing.

In October 2025, Array, together with its parent company MCS Inc., launched the RealStamp™ printing system, leveraging its Harrier digital printers driven by Raptor software and powered by Apex. RealStamp addresses the growing demand in the packaging market for printing complex, full-color content directly onto boxes - for example, hazard warnings, branding, shipping labels, and informational content.

Thomas explains: "Today's packaging customers want more than labels. They want high-quality, color images printed directly on boxes (cases) - and even marketing content printed inside the box. RealStamp enables that in a single pass."

RealStamp is a development project by Array leveraging the core printhead technology and drivers from their development partner HP. It has been designed to deliver a lower-cost, four-color CMYK direct-to-box printing solution. According to Thomas, Apex was essential to making the product viable: "We could not have achieved this without the Apex renderer. Our product architecture depends on its speed and scalability. This is a completely new application for Array. One of the main benefits was how quickly we were able to bring this technology to the market. If we hadn't worked with David and the team in the development of Mako, we would probably be a year out, whereas we launched RealStamp in October last year."

The platform has also enabled the development of scalable print bars, expanding print swaths from 4.25 inches up to 12.75 inches. By combining these print bars, Array can now deliver high-resolution, high-density color printing at speeds of 500–600 feet per minute - opening the door to new segments of the web press market previously inaccessible to the company.

The Harrier 108 Process Color Inkjet Printer for boxes offers low capital and operational costs. Easy to use and flexible, the Harrier prints on both sides and the tops of boxes at 1200 dpi with speeds up to 600 fpm.

About Array Technologies

Part of MCS Inc., Array Technologies was established in 2000 and is headquartered in Glastonbury, CT. The company provides innovative mission-critical hardware, software and workflow solutions globally across a wide variety of markets, including print, mail, packaging, and bindery. Products include industry-leading vision systems, variable data industrial inkjet solutions, and fully integrated software workflow solutions. https://arrayonline.com

hybridhelix.com/mako

Hybrid Software Inc.
One South State Street
Newtown, PA18940
United States of America
Tel: +1(215) 550-6243

Hybrid Software Helix Ltd
Building 2030
Cambourne Business Park
Cambourne, Cambridge
CB23 6DW UK
Tel: +44 (0)1954 283100

Global Graphics KK
613 AIOS Nagatacho Bldg.
2-17-17 Nagatacho, Chiyoda-ku,
Tokyo 100-0014
Japan
Tel: +81-3-6273-3198