

Synopsys and Rain AI

Rain AI Tapes-Out Low Power AI Accelerator Chip with Synopsys Cloud and IP in Under a Year

“Rain AI is on a mission to redefine compute for AI workloads and is designing AI accelerator chips for record balance between speed, power, area, accuracy and cost. Designing these complex architectures require best in class EDA tools and IP available on a robust chip design platform that enables cloud scale for EDA software. Synopsys Cloud provided unique capabilities to handle iterative and complex design cycles with unlimited license scalability to accelerate our entire project and deliver high quality results within schedule.”

~Jean-Didier Allegrucci, VP of Engineering, Rain AI



Overview

Rain AI, a US-based company founded in Silicon Valley in 2017, is on a mission to build the state-of-the-art AI accelerator that will power the future AI applications. Rain AI is building a physical AI accelerator with best-in-class compute efficiency, high accuracy, small form-factor, low power consumption, and on-device inference and training. Our commitment to co-design ensures unprecedented levels of performance, and through our innovations we aim to set a new standard in AI infrastructure products. Learn more at <https://rain.ai/>

“We were able to achieve a very fast infrastructure setup on the Synopsys Cloud EDA environment within days. The fully automated SaaS design environment was managed by Synopsys, and it allowed us to focus on our design rather than setting up the environment. The vast selection of EDAs and IPs available on the cloud enabled us to start the architecture exploration for AI workloads, design, verification, and backend flow within a few weeks. The analog instance jumpstarted the analog design, verification, and integration along digital blocks.”

~Jean-Didier Allegrucci, VP of Engineering, Rain AI

“The scalable and flexible pay-per-use access of EDA and compute resources allowed us to meet performance objectives with better quality by allowing quick iterations and meet time-to-market. By the minute access to verification, extraction and timing signoff through Synopsys Cloud FlexEDA accelerated time to results and reduced the overall design schedule by “30%.”

~Cagla Cakir, Custom Design Manager, Rain AI

Challenges

Rain AI addressed the following constraints in developing their AI accelerator chip:

- **Product Differentiation:** For designing world's most energy efficient AI hardware, required a novel AI design, developed from the scratch. This involved a complete SoC architecture exploration based on real life workloads. There was a need for an industry leading EDA software for this exploration
- **Design Integration:** Design involved both digital and analog with RISC-V integration. This demanded custom flows and RTL-to-GDSII implementation working in tandem to meet required PPA. This also meant multiple iterations for verification, timing and power signoff
- **Critical time-to-market with first pass silicon success**
- **Scalability and Elasticity:** Availability of scalable, on-demand EDA and compute resources to meet dynamic development requirements
- **CAD/IT:** No dedicated teams to support R&D, manage EDA and IP licenses, setup compute and license servers

It was important for Rain AI to address all of the above challenges to make sure product is translated from presentation to the actual hardware in a year!

Solution

Rain AI selected Synopsys Cloud SaaS design platform providing end-to-end EDA and IP solutions from Synopsys. The platform provided them a complete chip design environment offering access to latest cutting-edge compute and unlimited, on-demand pay-per-use by the minute license access in addition to the regular subscription.

- **Laying the foundation:** Synopsys Platform Architect™ helped creating an architecture based on AI workloads. This involved modelling, simulate and analyze the SoC architecture to ensure design KPIs are optimized
- **End-to-End Custom and Digital design flow:** Starting with layout design using Synopsys Custom Compiler™, physical verification using Synopsys IC Validator™, running parasitic extraction with StarRC™ solution, SPICE simulation using PrimeSim™ SPICE, implementing the full RTL-to-GDSII and finally running verification, timing and power signoff
- **IP Availability:** Leveraged Synopsys IP Solutions for AMBA - Infrastructure and Fabric and SLM SMS IP providing integrated test, repair and diagnostics solution that supports repairable or non-repairable embedded memories across any foundry or process node
- **On-demand Compute and EDA:** FlexEDA licensing model offering both subscription and pay-per-use by the minute access to highly scalable tools. In addition, latest compute resources provisioned instantaneously at a click of few buttons
- **Intuitive UI based platform:** Offering complete License management automation and CAD management functionality to handle entire CAD/IT setup without a need for dedicated team. Following features removed significant CAD/IT delays and improved engineering productivity along with the quality of design

Governance, ability to defining user privileges, real-time analytics and usage reports, complete project management controls, instant purchase and activation of licenses, auto-scaling of license servers to support peak burst for EDA workloads.

Synopsys Cloud offers a highly secure chip design environment that is SOC 2® Type 2 compliant.

Results

Synopsys Cloud offered one-stop-shop for complete EDA, IP and infrastructure needs. This resulted in

- **Production Environment:** Up and running in days instead of weeks
- **On-demand, pay-per-use access with FlexEDA:** Scalable compute and unlimited tool licenses speed time to market, enabling achievement of PPA targets and robust design by allowing more iterations in less time
 - Physical verification using IC Validator completed 3x faster
 - Extraction using StarRC completed 3x faster
 - Timing signoff using PrimeTime completed 4x times faster
- **True EDA-as-a-service:** Complete EDA SaaS model providing license management automation, pay-per-use EDA and compute access, pre-configured and pre-optimized EDA flows improved overall engineering productivity by 30%
- **Seamless Access to Synopsys IP:** All licensed Synopsys IP, and the required software were enabled seamlessly on the Synopsys Cloud platform for use by Rain AI engineers. This helped accelerate the process of integrating the following IP into our design
 - Interface IP
 - Star Memory System (SMS) Test and Repair
 - Star Memory System (SMS) Silicon Browser

