Efabless

Revolutionizing Chip Design with nClouds and AWS

Benefits Summary

Efficient Management and Execution of Multiple Batch Jobs

Scalable, Flexible, and Cost-Effective Architecture

Foundation for Future Developments

Industry

Application-Specific Integrated Circuit (ASIC), Electronic Design Automation (EDA), Semiconductor

Location

San Jose, California

Challenge

Creating a user-friendly platform for novice designers and ensuring scalable cost optimization

Featured Services

Cloud Architecture and Design, AWS Batch Setup and Configuration

About Efabless

Efabless was founded in April 2014 to "simplify chip creation and open it to everyone."

Efabless offers a platform that enables a decentralized, global community of chip experts and nonexperts to collaboratively design, share, prototype, and commercialize intellectual property blocks ("IP") and custom chips for machine learning at the edge and other innovative applications. Efabless pioneered the application of open-source and community models to make chip creation simple, fast, and affordable. Approximately 1,000 designs and 500 tape-outs have been executed on Efabless over the past two years. Efabless partners with AWS, nClouds, Google, Synopsys, GlobalFoundries, and SkyWater.

> **The heart of the solution lies in the management layer that Efabless has developed to control and monitor job execution.**

Challenges

Efabless faced several significant challenges in its pursuit of innovation and bringing open-source silicon design to the semiconductor industry. First, Efabless's vision of creating application-specific integrated circuit chips (ASICs) using open-source technology represents a groundbreaking approach. However, the semiconductor industry has long been characterized by big players tightly controlling the chip-design process. Convincing these established players of the viability and potential benefits of an open-source model was a considerable challenge during the early stages.

The process of designing a chip is inherently complex, risky, time-consuming, and expensive. Traditional chip design requires substantial resources, including specialized expertise, sophisticated tools, and access to foundries. The target market for the Efabless platform includes individuals with limited chip design experience. Developing a user-friendly and intuitive platform that could cater to novices while still delivering high-quality chip designs was a delicate balancing act and challenge for Efabless. Likewise, overcoming these challenges and making chip design more accessible to a broader audience were major hurdles.

While open-source initiatives encourage sharing and collaboration, the risk of competitors poaching ideas or implementing similar solutions was ever-present. Finding ways to protect its innovations and maintain a competitive edge was crucial for Efabless. Scalability and cost optimization were also major challenges, as was building a platform that could handle multiple designs and processes while keeping costs manageable. Efabless needed to ensure that the platform could scale effortlessly and efficiently, only provisioning resources when required.

Why AWS and nClouds

Efabless recognized the need for a robust and scalable cloud infrastructure to support its innovative chip design platform. AWS was the ideal choice due to its extensive range of services, flexibility, and proven track record in providing reliable cloud solutions.

As an AWS Premier Tier Services Partner, nClouds has extensive experience and expertise in building and managing complex cloud environments on AWS.

Additionally, Efabless partnered with nClouds to design, implement, and manage the AWS environment. nClouds' expertise in cloud consulting and managed services made it the perfect match for Efabless's requirements.

nClouds Solution Architecture for Efabless

The solution for Efabless utilized AWS to manage the entire chip-design process, which involved multiple steps to create manufacturable and runnable chips. Users rely on automation to make design decisions, run simulations, and develop the chip design. Once they have a valid design, they come to Efabless to integrate it into a harness, a management wrapper around their design that enables the manufacturing of multiple projects at a fraction of the typical cost of traditional electronic design automation (EDA) design.

The entire process is managed within the AWS Batch infrastructure, which provides the backbone for efficient and scalable job execution. The final stage in the chip-design process is referred to as "tape-out," where Efabless merges its management wrapper with the user's design. The user initiates this stage by submitting a request through the user portal, indicating that they are ready for the tape-out process to begin.

The heart of the solution lies in the management layer that Efabless has developed to control and monitor job execution. This management layer ensures effective logging, real-time notifications, and exception handling. It provides live updates from the running batch job and enables efficient monitoring and management of jobs that might fail.

Key components of a batch job include the use of Docker containers, where all the dependencies required for the job are defined in the Docker file. This ensures consistency and portability across different computing environments. The job script, provided by Efabless's EDA developers, dictates the actual functionality of the job, making it adaptable and customizable to different user requirements.

The outputs generated during the batch job are stored in various locations. The logs are stored in Efabless's database for easy access and querying. Additionally, temporary job outputs may be placed in Amazon Simple Storage Service (Amazon S3) buckets to facilitate user access and downloading of artifacts.

The solution allows Efabless to efficiently manage and execute multiple batch jobs, including tape-out and precheck jobs. The architecture ensures scalability, flexibility, and cost-effectiveness, enabling Efabless to handle various chip-design processes simultaneously. As Efabless anticipates growth and an increase in the number and complexity of batch jobs, the architecture and management layer provides the necessary foundation to support these developments.
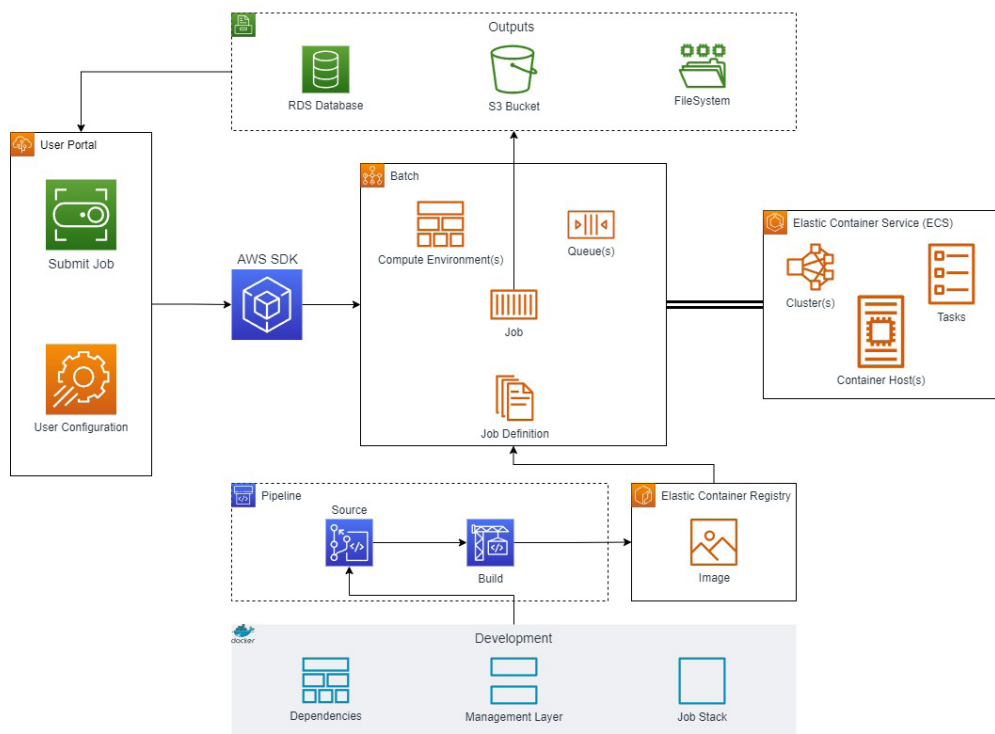
Efabless Leveraged Several Key Amazon Web Services

- **Elastic Beanstalk:** The microservices required for the platform were hosted on Elastic Beanstalk, ensuring seamless scalability and easy deployment.

- **Amazon RDS:** Efabless used Amazon RDS to power its databases, providing robust data storage and high availability for user projects.

- **Elasticsearch:** The platform leveraged Elasticsearch for centralized logging, enabling Efabless to monitor and troubleshoot its infrastructure efficiently.

- **AWS Batch:** AWS Batch was instrumental in managing the batch processing of chip

designs, validating designs, and preparing artifacts for fabrication.

- **Amazon EFS:** Amazon EFS served as the network file system, securely storing the results of precheck and tape-out processes.

- **Backup and Disaster Recovery:** AWS Backup facilitated the reliable backup and recovery of critical data, ensuring the platform's data integrity.

- **CloudFormation:** Efabless followed best practices using CloudFormation, deploying infrastructure as code to maintain a consistent and reliable environment.

Increased Business Efficiency

The collaboration between Efabless and nClouds resulted in significant benefits for both the platform users and the companies involved.

Efficient Management and Execution of Multiple Batch Jobs

The solution enables Efabless to handle various chip design processes, such as tape-out and precheck jobs, efficiently and concurrently using AWS Batch infrastructure.

Scalable, Flexible, and Cost-Effective Architecture

The architecture ensures scalability to accommodate Efabless's anticipated growth and increasing complexity of batch jobs. It provides the flexibility to adapt to different user requirements and offers a cost-effective approach to chip design.

Foundation for Future Developments

The management layer and architecture form a solid foundation for Efabless to support its growth trajectory. As the company anticipates an expansion in the number and complexity of batch jobs, this solution is well-equipped to handle the challenges and foster innovation within the semiconductor industry.

By leveraging AWS services, Efabless developed a user-friendly platform for chip designers, overcoming industry challenges and making chip design more accessible. The scalable and cost-effective architecture provided a foundation for future growth, enabling efficient management and execution of multiple batch jobs. The partnership demonstrated how cloud consulting experts and innovative companies could transform industries and deliver cutting-edge solutions for chip design.

ABOUT
nClouds

nClouds is a certified, award-winning provider of AWS and DevOps consulting and implementation services. We partner with our customers as extensions of their teams to build and manage modern infrastructure solutions that deliver innovation faster. We leap beyond the status quo.