Genomic Analysis Platform Modernization

Cloud Migration and Workflow Modernization for Genomic Data Management

Liminal Labs was contracted by a genomics company to migrate and modernize the web application of an acquired analysis platform specializing in transforming short-read sequencers into single-molecule, long-read sequencers. Over the course of three months, Liminal created a robust AWS infrastructure, upgraded the system for scalability, improved file upload capabilities, and transitioned the app's authentication system to OAuth 2.0.

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The Client:

- **Industry**: Genomics
- **Project Duration:** 3 months
- **Services Used:** AWS (EKS, RDS, Lambda, SQS, SNS, CloudFront, Cognito, Route 53), GitLab CI, Terraform
- **Languages / Frameworks:** Python (Django), JavaScript, Terraform, Kubernetes
- **Domains:** Cloud-Native Services, Web Application Development, Serverless Architectures

Background:

The client's acquisition included a web application used by researchers and services teams engaged in drug discovery research. The app, written in Python using the Django framework, needed to be migrated from Azure to AWS to support growing demand, improve reliability, and modernize key systems, including workflow orchestration and authentication.

Liminal Labs was engaged to manage the cloud migration, ensuring stability, scalability, and security for both internal teams and external researchers.

The Challenge:

The client faced several technical challenges in migrating their container-based web application and databases from Azure to AWS. This required not only a complete transition to a new cloud environment but also the creation of both development and production environments to ensure ongoing operations. Additionally, the existing task management system, which struggled with scalability, needed to be rewritten as a serverless architecture to better support the growing demands of genomic data analysis.

The client also needed this new platform to handle massive file uploads. Individual genomic datasets reached up to 100 GB, which the existing infrastructure could not accommodate.

Finally, to improve security, the client wanted to migrate their app's authentication system to OAuth 2.0. This needed to be upgraded without interrupting the current user experience for thousands of active users.

The Solution:

Liminal oversaw the successful migration of the client's application and all production data from Azure to AWS, providing support to the client's internal teams throughout the transition to ensure smooth operations and continuous functionality during the process.

Solution Architecture

Liminal built AWS infrastructure to support the containerized Django web application, deploying environments via Amazon EKS and introducing Amazon RDS for data management, ensuring disaster recovery and security. A continuous delivery pipeline using GitLab CI was also implemented to streamline deployments.

Improved Scalability

Liminal rewrote the existing Celery-based task manager into a serverless workflow using AWS Lambda, SNS, and SQS, which improved scalability and reduced operational overhead.

To accommodate large genomic datasets, file upload capabilities were upgraded to handle files up to 100 GB directly through the browser.

Authentication and Data Migration

Liminal migrated the authentication system to OAuth 2.0 using Auth0, ensuring seamless integration and migrating over 1,000 users without disruption.

All production data was successfully migrated from Azure to AWS with minimal downtime, and the services team was supported throughout the transition for operational continuity.

The Results:

The application experienced faster, more reliable performance on AWS. The shift to serverless workflows reduced complexity and improved scalability. File upload capabilities for large datasets were significantly optimized, making it easier for researchers to handle high-throughput genomic data.

The OAuth 2.0 migration aligned the platform with company-wide security standards without impacting the user experience.

Our Core Capabilities:

At Liminal Labs, we build scalable software solutions for life sciences and social impact organizations, focusing on Solution Architecture, Cloud Infrastructure, and Full Stack Development. We help advance precision medicine, bioinformatics, and medical imaging while ensuring security, compliance, and seamless integration so your software grows with you.

Solution Architecture

We deliver robust, secure designs tailored to life sciences and healthcare, maintaining the highest standards of scalability and compliance.

- Authorization / SSO
- Third-Party Integrations
- Model as a Service (MaaS)
- Data Privacy, Security, and Retention

Cloud Infrastructure

We provide cloud infrastructure solutions for life sciences, ensuring secure, resilient, and efficient operations. Our expertise enables life sciences organizations to stay focused on their core objectives.

- Azure, AWS, GCP, Docker / Kubernetes
- Deployment Pipelines
- Autoscaling and Load Balancing
- Backups and Disaster Recovery
- Identity and Access Management

Full Stack Development

Our high-performance application solutions feature responsive dashboards, data visualizations, and instrument control interfaces.

- Custom software
- Instrument UIs
- Data visualizations
- Dashboards and file browsers
- Enterprise apps

Get in Touch

Want to learn more? Contact us for a free consultation and start your project with Liminal Labs. connect@liminal.sh