Optimizing High-Volume Data Aggregation: Deploying & Managing Young Living's Volume Aggregator RDS PostgreSQL Database

Introduction

This case study outlines the greenfield deployment of Young Living Essential Oil's Volume Aggregator workload to AWS using Amazon RDS for PostgreSQL. Led by TrueMark, the initiative delivered a secure, high-availability, and scalable data aggregation platform critical to processing global transaction volumes for commission calculations and business analytics. Beyond the initial deployment, TrueMark continues to manage and optimize the database environment, ensuring performance, reliability, and security remain aligned with evolving business requirements. This project demonstrates how AWS managed database services accelerate time-to-value for new enterprise applications while sustaining operational excellence over time.

About The Customer

Young Living Essential Oils, LC ("Young Living"), headquartered in Lehi, Utah, is a globally recognized leader in essential oils and renowned for offering the highest quality oil-infused products. With its industry leading Seed to Seal® quality commitment, Young Living sets the benchmark in ensuring authenticity and environmental stewardship. This commitment is integral to their operations, from sourcing ingredients from corporate-owned and partner farms, as well as other reliable suppliers. Beyond promoting a healthy lifestyle through their products, Young Living plays a pivotal role in the lives of over 6 million Brand Partners worldwide.

Customer Challenge

Young Living required a new database platform to support its critical Volume Aggregator application, which calculates global sales volumes and partner commissions. The requirements for this greenfield implementation included:

- Supporting predictable month-end processing peaks.

- Handling annual data growth of ~30% starting from an initial 1 TB dataset.
- Maintaining consistently low replication lag during intensive aggregation cycles to ensure near real-time reporting.
- Top tier Brand Partners rely on continuous database access and any downtime directly results in lost revenue.
- Enabling separation of read and write workloads to prevent reporting queries from impacting transactional performance.
- Providing a fully managed solution that eliminates infrastructure administration overhead.

While all of these customer requirements presented complex challenges, the most difficult and unique was the high rate of insert and delete operations in the database, effectively re-writing itself multiple times per day. This unusual pattern created replication lag risks and instability in read replicas, making it essential to design an architecture that could deliver reliable near real-time reporting.

Partner Solution

TrueMark designed and implemented a high-performance, cloud-native data aggregation platform using Amazon RDS for PostgreSQL. The solution was built to handle predictable ingestion bursts, high concurrency processing, and complex aggregation queries while maintaining strict security controls. This new implementation delivered enterprise-grade capabilities without infrastructure management overhead.

Why Not Aurora PostgreSQL?

Alternative options such as Amazon Aurora PostgreSQL were evaluated. However, Aurora replicas occasionally fell too far behind the writer under heavy Volume Aggregator insert/delete workloads, causing reader restarts. For this workload, RDS for PostgreSQL provided more predictable performance..

Key Services Utilized

- **Amazon RDS for PostgreSQL**: Managed relational database service deployed in Multi-AZ configuration with dedicated read replica across availability zones
- **Amazon CloudWatch & Performance Insights**: Real-time monitoring of critical database metrics with custom alerting
- **AWS Secrets Manager**: The master password and separate application passwords were generated and safely stored within the Secrets Manager
- **StrongDM**: Secure, auditable human access to production databases
- **Terraform**: Infrastructure as Code for consistent environment provisioning

Implementation Process

- **Architecture Design & Requirements Alignment**
  TrueMark assessed Young Living's needs for high availability and the ability to handle large-scale aggregation queries. Based on this we chose a Multi-AZ RDS for PostgreSQL deployment with a read replica to split the processing.

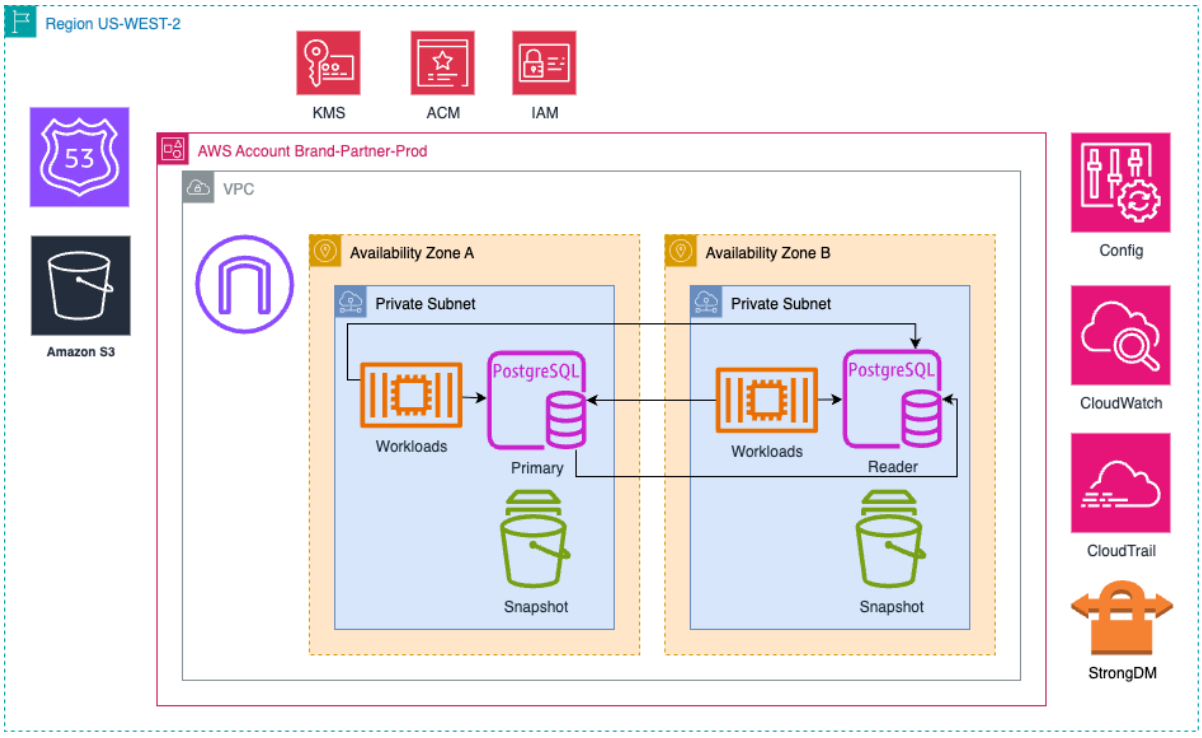
- **Disaster Recovery Configuration**
  The primary instance was deployed in Multi-AZ mode for automatic failover, with a read replica in a separate Availability Zone. This configuration provides resilience and a tested disaster recovery path via read replica promotion.

- **Security & Compliance Implementation**
  - Database encryption at rest using AWS KMS with environment-specific key policies.
  - Application credentials stored in AWS Secrets Manager.
  - Human access managed through StrongDM for secure, auditable access.
  - Production and non-production environments fully isolated via separate VPCs and database credentials.
  - Automated provisioning using Terraform ensures consistency and auditability across environments.

- **Infrastructure Deployment**
  Resources were provisioned using Terraform, enabling version-controlled, repeatable deployments across environments. This Infrastructure-as-Code approach eliminated configuration drift and accelerated environment replication for testing and development.

- **Testing and Cutover**
  Executed performance tests, failover simulations, and validation scenarios before transitioning to production.

- **Ongoing Monitoring & Optimization**
  CloudWatch and Prometheus dashboards provide real-time visibility. TrueMark provides ongoing performance and reliability assessments, identifying optimization opportunities and ensuring database stability.



Business Impact and Benefits

The successful deployment of Young Living's Volume Aggregator Database on Amazon RDS for PostgreSQL delivered substantial business and operational improvements:

- **Accelerated Time-to-Value**: The greenfield approach enabled deployment of a production-ready database platform in weeks rather than months.
- **Predictable Performance at Scale**: The architecture successfully handles predictable monthly processing peaks while maintaining consistent performance for both transactional and analytical workloads.
- **Enhanced System Resilience**: Automated Multi-AZ failover reduces potential recovery time objectives to under 60 seconds, significantly improving system resilience for critical business processes.
- **Operational Efficiency Gains**: Infrastructure as Code implementation reduced environment provisioning time from days to hours, while eliminating configuration drift between environments.

- **Cost-Effective Resource Management**: Quarterly right-sizing exercises ensure optimal resource allocation, avoiding unnecessary overprovisioning while maintaining performance headroom.

- **Streamlined Security Compliance**: Automated credential rotation and strict environment segregation have strengthened security posture while reducing administrative overhead.

Operational Challenges and Lessons Learned

While the deployment met Young Living's initial performance and availability goals, several operational challenges were encountered in production that provided important learning opportunities:

- **Parameter Tuning:** To stabilize the environment, several RDS PostgreSQL parameters were adjusted, including autovacuum_max_workers and maintenance_work_mem. These changes were later validated and standardized across environments.

System Stability and Efficiency Summary

- **Database Availability**: The RDS environment consistently meets AWS's published 99.95% availability SLA for Multi-AZ deployments.

- **Performance Stability**: Monitoring shows consistent performance metrics with resources operating well within capacity thresholds during typical operations. The primary database hasn't exceeded 60% CPU usage, and the read replica peaks at 85% CPU during month-end processing, well within safe limits. Replication lag occasionally spikes up to ~240 seconds a few times per month, but the system has consistently absorbed these events without user-visible impact.

- **Operational Efficiency**: Low queue depths and stable connection counts have significantly reduced the need for manual performance tuning.

Ongoing Database Management

Beyond the initial migration, TrueMark continues to manage the Young Living Volume Aggregator database to ensure the environment remains secure, performant, and aligned with AWS best practices well beyond deployment.

General Database Management

- RDS configurations are maintained via infrastructure as code, using Terraform and Bitbucket pipelines.

Maintenance and Upgrades

- TrueMark coordinates and executes both major and minor version upgrades for RDS PostgreSQL, including patching and certificate renewals.
- Upgrades are tested and validated collaboratively with Young Living in non-production environments, and then applied during the monthly scheduled maintenance windows to ensure minimal disruption to business operations.

Database Troubleshooting & Incident Response

- TrueMark's Enterprise Operations Center (EOC) monitors the Volume Aggregator Database and responds to incidents impacting performance or availability.
- Corrective actions such as log analysis, index creation, query optimization, and resizing are executed through change management, minimizing downtime and maintaining database integrity.

Query Optimization and Instance Management

- We continuously identify and resolve bottlenecks through schema consulting, query tuning, and right-sizing of instance types and storage configurations.
- Findings and recommendations are documented in Site Reliability Reports (SRRs) delivered to Young Living.

Alarms, Metrics, and Observability

- Amazon CloudWatch dashboards, Performance Insights, and tailored alarms are configured to track CPU, RAM, storage thresholds, and query performance.
- TrueMark investigates triggered alarms and provides remediation to prevent service degradation.

Security Management

- IAM role enforcement, security group governance, and database role/user management are implemented through infrastructure as code.
- Continuous auditing and logging safeguard compliance with Young Living's regulatory requirements.

On-Demand Services

- TrueMark allocates additional hours for specialized database requests, ensuring Young Living has flexibility to adapt as business and compliance needs evolve.

About TrueMark

TrueMark, an IT Solutions provider and AWS Advanced Tier Partner, holds the AWS Migration Competency and the Amazon RDS Database Migration Service Delivery designation, demonstrating proven expertise in guiding customers through complex cloud adoption and database modernization journeys. We excel in helping companies migrate, modernize, manage, and support their infrastructure on AWS. Our work consistently delivers improvements in efficiency, consistency, cost optimization, scalability, and security.

Our competitive advantage stems from our ability to attract and retain a team of highly skilled professionals and equip them with the tools, frameworks, and reusable automation patterns needed to tackle challenging projects successfully. At TrueMark, our commitment is to consistently deliver substantial value to our customers and to always act in their best interest, ensuring that our solutions not only meet but surpass expectations.