



Modernizing Oracle at Scale: Migration & Ongoing Management of Young Living's RDS Oracle Custom Database

Introduction

To complete the most complex stage of their cloud journey, Young Living partnered with TrueMark to migrate their massive Oracle database that supported more than 250 critical services. The database's requirement for Edition-Based Redefinition (EBR) required Amazon RDS Custom for Oracle, as standard RDS did not support this critical feature at the time. RDS Custom delivered a secure, compliant, and high-performance environment while also reducing costs and optimizing storage. Today, TrueMark continues to manage the database to ensure it remains resilient, efficient, and ready to meet Young Living's future needs.

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 Essential Oils plays a pivotal role in the lives of over 6 million Brand Partners worldwide. These partners find not only a sense of purpose but also a pathway to whole-life wellness by aligning with Young Living's values and mission.

Customer Challenge

As Young Living approached the final leg of their AWS cloud migration journey, the time had come to solve the most difficult problem remaining which was the migration of their largest most I/O intensive customer facing database workload that was still running in their datacenter. This step was crucial for improving their customer experience, a goal unattainable without migrating all systems, including this substantial Oracle database, to AWS.

Located in their Portland, Oregon data center, this Oracle database was vital, acting as the backbone for over 250 business critical services, applications and processes. However, its migration posed significant challenges:

- **Memory and Performance Requirements:** Operating efficiently demanded over 1TB of memory.
- **Licensing Constraints:** The database was restricted to 16 cores due to licensing requirements.
- **Feature Necessities:** Essential features like Edition-based Redefinition (EBR) for seamless PL/SQL code deployments weren't supported by standard RDS for Oracle.
- **Security and Compliance:** Being in PCI scope and containing PII, the database contained sensitive data, necessitating stringent security measures.
- **Complex Data Types:** The extensive use of BLOBs and CLOBs added complexity to the migration process.
- **High Transaction Volume:** To handle peak sales periods, the database utilized a dedicated solid-state X70 Pure Storage array, ensuring optimal performance and minimal I/O latency.
- **Space Optimization:** Several terabytes of unreclaimable space in a large tablespace presented difficulties for traditional migration methods like RMAN COPY and replication.
- **Testing and Deployment:** Post-migration, the database needed to support cloning and scrubbing for over 20 non-production environments, all through automation.
- **Tight Cutover Window:** The entire database had to be fully migrated, tested, and operational within a 4-hour window.
- **Application Integration:** Over 250 applications and services interfaced with the database requiring updates with new connection settings within a 4-hour timeframe during the maintenance window.

These challenges demanded a meticulously planned, innovative approach to ensure a seamless transition without compromising Young Living's operational efficiency or customer experience.

Journey to Our Solution

It was clear that this project was about more than just technical migration—it was about paving the way for their future business growth. With our most senior engineers on the project, TrueMark aimed to meet the intense challenges presented head on. Our team took a deep dive into understanding the unique workloads running in the environment, which allowed us to identify a solution that extended beyond standard technical approaches. Leveraging AWS services such as AWS RDS Custom for Oracle and the AWS Database Migration Service (DMS), we crafted a strategy that was not just about moving data but transforming how Young Living operates this environment through automation. The following sections detail the key components of the

solution, showcasing our innovative use of AWS services and the comprehensive support provided throughout the migration journey.

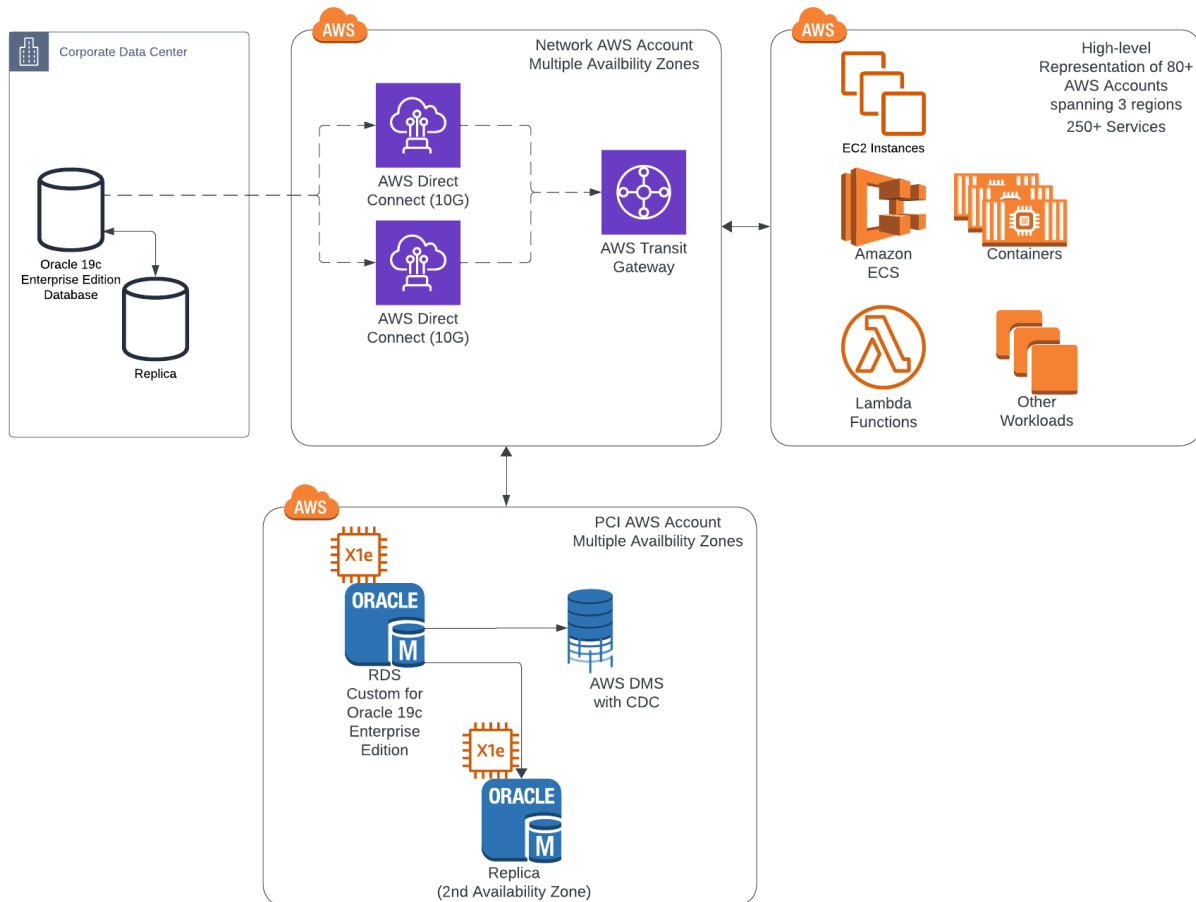


Fig 1: High-level architectural diagram of solution

Customized Instance Deployment

Our strategy commenced with deploying two RDS Custom for Oracle instances on db.x2iedn.8xlarge types, meticulously selected to align with Young Living's specific memory and CPU requirements, while adhering to licensing constraints. These instances were created through Hashicorp Terraform automation and established within a dedicated AWS account, specifically configured for handling PCI workloads, thereby ensuring the highest standards of security and compliance. This deployment signified a groundbreaking development in the AWS RDS ecosystem, given that these instance types were not yet publicly available for RDS Custom for Oracle. Our ability to leverage these previously unused instance types stemmed from a strong partnership with AWS, which facilitated this innovative move.

Leveraging AWS Database Migration Service

The core of the migration hinged on our extensive use of AWS Database Migration Service (DMS), particularly its Change Data Capture (CDC) capabilities. This approach was pivotal in managing the migration within the tight cutover window while handling the database's high transaction volume. By leveraging DMS, we significantly trimmed excess storage space in the database, achieving almost 10TB of storage reduction during migration. This optimization was evident in the substantial reduction of free space within the database from 9.68TB in the original database down to just 0.38 TB post-migration, thus enhancing the overall efficiency of the database.

Moreover, using RDS Custom for Oracle enabled us to meet specific feature requirements essential for Young Living, including Edition-based Redefinition (EBR) critical to their zero downtime deployment strategy. We also met the rigorous I/O performance demands by leveraging finely tuned io1 EBS volumes, ensuring the database maintained its high-performance standards post-migration.

The large BLOB and CLOB data was handled using separate DMS tasks tuned specifically for the data size of each table to maximize the use of the 10Gig direct connect circuits from the data center. In order to leverage change data capture (CDC), which was critical for the amount of data being migrated, the use of Binary Reader instead of LogMiner was necessary to read the raw REDO logs from the Oracle database and ensure success within the maintenance window.

Pre-Migration Strategy and Testing

In our thorough preparations for the migration, we conducted several trial migrations to identify and resolve potential issues, ensuring a comprehensive evaluation of all connected services. This pre-migration phase also included an extensive period of feedback collection and analysis. By maintaining an open line of communication with Young Living, we were able to gather and utilize valuable insights, instrumental in refining our migration strategy and minimizing risks. This also allowed us to identify all 200+ applications and services that needed to have connection strings updated post cutover which allowed a detailed plan to be created to ensure an overrun of the maintenance window did not occur.

Post-Migration Support and Optimization

Our involvement continued to be crucial following the migration. By using a combination of AWS CloudWatch, Oracle Enterprise Manager and our custom tooling, we meticulously monitored the database performance throughout the production cutover, making real-time adjustments informed by insights gained during the testing phases. Our extensive post-migration testing focused particularly on service health, ensuring the migrated system had minimal operational impact on Young Living. This diligence was key in verifying the integrity of customer data and ensuring the seamless functionality of the interconnected applications.

Through our heavily engineered and detailed solution, we not only addressed the immediate technical challenges but also significantly enhanced Young Living's data handling capabilities. The collaboration with AWS played a pivotal role in aligning the solution with Young Living's goals of scalability, and performance, marking a key achievement in their Cloud migration journey.

Ongoing Database Management

Beyond the initial migration, TrueMark continues to manage the Young Living YLPRD 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 Oracle Custom, 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.

Refreshing Lower Environments

- TrueMark manages non-production environment refreshes by creating sanitized copies of production data. We remove all sensitive information from production snapshots and reduce the database size from 7+ TB to 512GB for lower environments. This process provides realistic test data while achieving over 90% cost savings on non-production infrastructure and ensuring compliance with data protection requirements.

Database Troubleshooting & Incident Response

- TrueMark's Enterprise Operations Center (EOC) monitors the Shipping 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.

Long-term Business Benefits

The successful migration of Young Living Essential Oils' Oracle database to AWS RDS Custom for Oracle led to significant improvements in performance, availability and reliability directly addressing the initial challenges. This RDS migration project not only met but exceeded the technical and operational expectations, adding significant value to Young Living's business. The quantifiable improvements in terms of space efficiency and cost reduction, along with the enhanced performance of key services, exemplify the strategic success of the migration effort.

Space and Cost Savings

This space optimization translated into significant monthly cost savings, estimated at around \$18,138, factoring in both production and replica instances. The migration resulted in substantial storage optimization and cost savings, as detailed in the following table:

Metric	Before DMS	After DMS	% Reduction
Reserved Space	15.88 TB	5.07 TB	68.1%
Free Space	9.69 TB	0.38 TB	96.1%

$$\text{percentage_reduction} = ((\text{initial_space} - \text{final_space}) / \text{initial_space}) * 100$$

Performance Improvements Across Services

The migration also led to marked improvements in service response times, as illustrated in the table below. These enhancements were not limited to just these services; over 120 microservices experienced decreased latency, contributing to a better overall user experience and more efficient operation.

Service	Before DMS (avg sec)	After DMS (avg sec)	% Improvement
Payments Service	4.64 s	4.29 s	7.5%
Tax Service	0.050 s	0.019 s	62.0%
Fraud Service	0.700 s	0.514 s	26.5%

$$\text{percentage_improvement} = ((\text{initial_response} - \text{final_response} / \text{initial_response}) * 100$$

In summary, the RDS migration project not only met but exceeded the technical and operational expectations, adding significant value to Young Living's business. The quantifiable improvements in terms of space efficiency and cost reduction, along with the enhanced performance of key services, exemplify the strategic success of the migration effort.

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.