

Building a Resilient Architecture with AWS

AWS Migration Case Study

Executive Summary

GoPanza is the developer of an e-commerce SaaS platform focused on the digital transformation of grocery stores. Its platform uses artificial intelligence to provide shoppers with a convenient in-store shopping experience via mobile and desktop devices, with the ability to pick up their orders or have them delivered to their doorstep, allowing grocers to access the most efficient way for retailers to grow in the convenience economy.

The challenge

GoPanza wants to migrate its Azure resources to AWS to take advantage of the significant advantages offered by AWS services, creating a robust and reliable infrastructure, while keeping costs within the allocated budget. **GoPanza** seeks to improve the availability of the current cloud workload architecture by building a resilient architecture with AWS. To achieve this, you need to use some AWS managed services, such as RDS for databases, AWS Fargate with ECS for compute instances, and OpenSearch services for search engines. Replicating infrastructure on AWS using its services requires adapting some parts of the infrastructure, as some services work differently, and we need to find the best configuration of these services to maintain reliability.

Why AWS?

AWS provides a wide variety of services and solutions that can meet specific customer needs and by making the right configuration you can get a powerful architecture at a low cost. Migrating to AWS will provide the customer with a more robust, flexible, and scalable infrastructure, with advanced security, high availability, and disaster recovery capabilities. Utilizing managed services such as RDS, Fargate with ECS, and OpenSearch will not only improve operational efficiency, but also help keep costs under control, allowing the customer to focus on the innovation and growth of their e-commerce SaaS platform.

About the customer



GoPanza digitally transforms brick-and-mortar grocery stores with its grocery e-commerce platform.

"Create an online store that complements your physical location, while adding tools to improve sales and margins."

GoPanza has twice been chosen as the "Platform of Excellence for Online Shopping" in MIDA's Consumer XRay in 2019 and 2020.

Their small but mighty team has more than 50 years of combined experience.

The Solution

Moving **GoPanza** resources from Azure to AWS and building a robust, reliable, and resilient infrastructure initially required the IO Connect Services team to conduct extensive research on the wide variety of services AWS offers, as it was critical to select the most appropriate services to meet the customer's infrastructure requirements with specific services on AWS.

A strategy was defined to replicate the AWS cloud infrastructure using some AWS services such as RDS for databases, AWS Fargate with ECS for compute instances, and OpenSearch for search engines. Since some parts of the infrastructure needed to be adapted, because some services work differently, and it was imperative to apply the best configuration of these services.

"Reliability".

It refers to the consistency, reliability, and reliability of a system, process, or measurement to perform its intended function or produce consistent results over time.

This feature can be achieved with a few configurations, such as High Availability, Disaster Recovery, and Continuous Business.

To address and improve our customer's current situation, firstly, the databases were moved to some RDS instances with SQL Server with Multi-AZ deployment to ensure high availability. It was also recommended for the services to make use of automatic backups to guarantee the availability and integrity of the data in case of any problems, in addition to having an architecture aligned with AWS best practices and recommendations.

To host the application, the IO Connect Services team recommended using services such as Fargate with ECS, as their application is container-based. AWS Fargate helps provide features such as high availability by using multiple hardware instances and scaling the application according to customer needs, thus always ensuring high performance.

The client needed a search service that would allow them to index their data for easy access. To meet this customer-specific requirement, the IO Connect Services team decided to use the Amazon OpenSearch service, which allows the creation of instances to store indexes and replicate them to other instances deployed in a different Availability Zone. This feature configured with autoscaling provides reliability to the data and the entire architecture.



Keys to a Resilient Architecture

- **Geographical distribution**
- **Redundancy**
- **Replication**
- **Autoscale**
- **Fault Isolation**
- **Automatic Recovery**
- **Monitoring**
- **Fault Management**
- **Load Testing**
- **Disaster Simulation**

The Solution

The IO Connect Services team decided to implement a multi-account mechanism to address requirements related to account governance. Therefore, a strategy was defined through AWS Organizations and AWS Control Tower for the organization of the workload, in addition to integrating security solutions into the infrastructure by implementing a three-layer architecture design.

AWS Organizations was configured with AWS Control Tower taking advantage of the benefits of these services to have the implementation of a multi-account easily and securely, in addition to having an architecture aligned with AWS best practices and recommendations. This approach also reduces the explosion radius of vulnerabilities and threats and facilitates compliance complexity by providing mechanisms to separate access to resources.

The implementation of AWS Control Tower and AWS Organizations provided a great way to centrally manage the AWS cloud infrastructure, allowing for better organization and management of accounts, where previously we had a single account that GoPanza used as the primary account, a new account was created that will act as the primary account. In addition to ensuring security and compliance, controlling costs, and automating the deployment and management of AWS resources.

Based on the above, it was first necessary to create a multi-account structure with its respective Organizational Units (OUs) and the necessary configuration that consisted of the following:

A landing zone at us-west-2 (Oregon)

An organization with:

- Management Account
- Security OU with Log Archive and Audit Accounts
- OU Dev with Dev Account
- OU Prod with Prod Account
- Current Account

The following high-level architecture diagram shows this new organization:

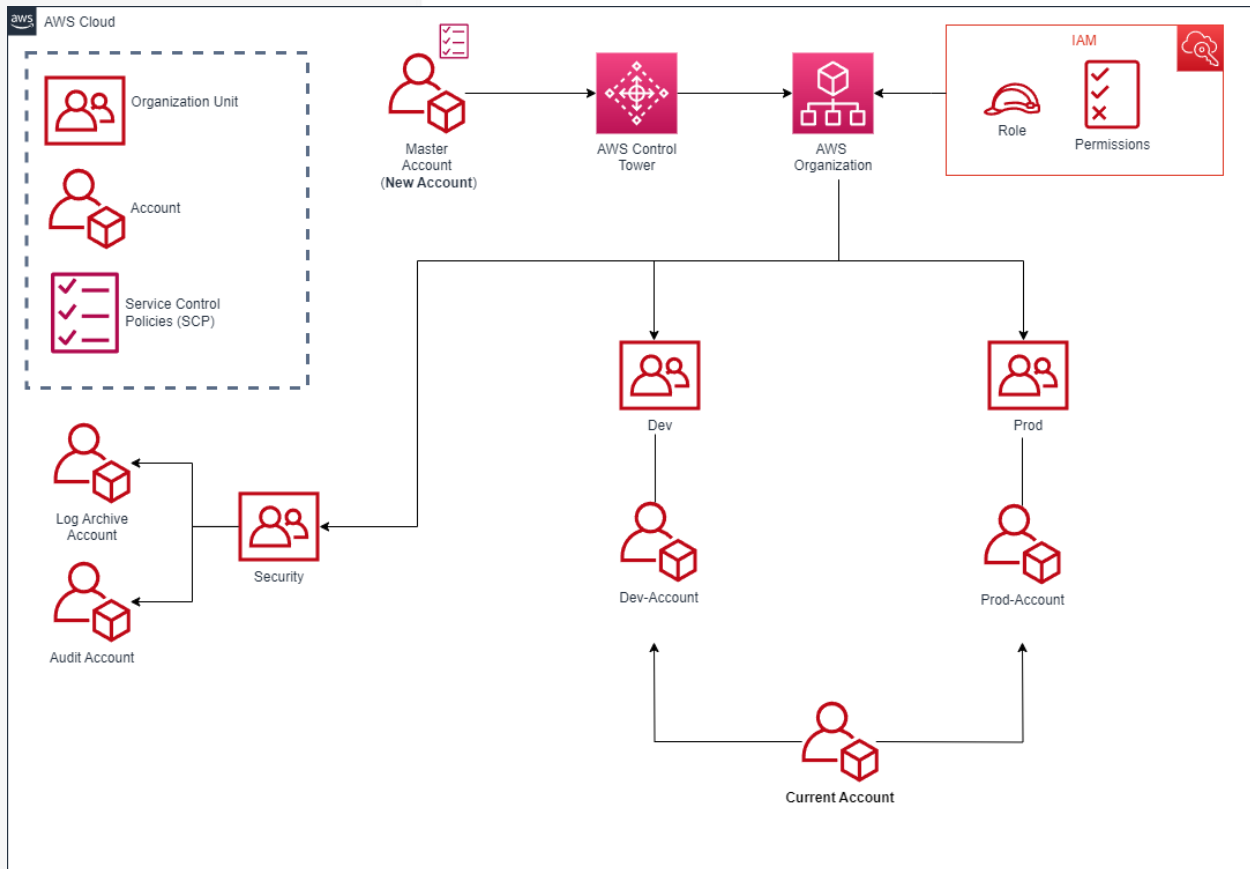


Figure 1 – GoPanza Multi-Account and Control Tower Architecture

Our approach to ensuring resiliency in application design is based on a robust and highly available architecture. To meet the requirements set, a robust application architecture has been developed that ensures high availability and resiliency for GoPanza's critical workload.

We have designed an architecture for GoPanza that is based on principles of redundancy and scalability to ensure that the GoPanza application is available even under harsh conditions. This architecture is based on the implementation of highly available AWS services, such as Application Load Balancer (ALB), Amazon RDS with SQL Server, AWS Fargate with Amazon ECS, and Amazon OpenSearch with a Multi-AZ strategy, which allows resources to be distributed across different AWS Availability Zones to provide redundancy and eliminate single points of failure. This strategy provides resiliency against local calamities and ensures that the application can handle traffic spikes without performance degradation.

High Availability on AWS

- **Geographical distribution**
- **Horizontal Scalability**
- **Redundancy**
- **Load Balancing**
- **Disaster Recovery**

High Availability Architecture

Similarly, the architecture is configured with the automatic scaling of the application so that you can add more components according to the customer's needs to take advantage of all the benefits of these services and in turn guarantee high system availability. The use of automatic backups was also configured to guarantee the availability and integrity of the data in case of any problem, with all this in addition to an architecture aligned with the best practices and recommendations of AWS.

The application architecture is designed to ensure high availability and fault tolerance by implementing the following principles:

Geographic Distribution: Use multiple AWS Regions to distribute workload and ensure continuous availability of services.

Horizontal Scalability: Application components can be scaled out by adding more instances or containers to dynamically adapt to changes in demand, avoid bottlenecks, and maintain optimal performance.

Redundancy: Critical application components are replicated across multiple instances to ensure that the application remains accessible even if any of these components fail.

Load Balancing: An Application Load Balancer (ALB) is used to distribute traffic across the application's containers and prevent a single container from becoming overloaded. The ALB is configured to scale out, allowing more nodes to be added as needed, this ensures that the web application is highly available and can automatically scale to cope with unexpected traffic spikes.

Disaster Recovery: A disaster recovery plan is implemented to restore the application in the event of a major failure, such as a power outage or regional failure.

Reliability on AWS

- **Autoscale**
- **Multi-AZ**
- **Safety**
- **Automatic Backups**
- **Monitoring**

Results and benefits

AWS offers several ways to ensure infrastructure reliability. With the right configuration, we can achieve 99.9% availability and create a robust, fault-tolerant infrastructure.

Autoscale

It allows you to increase or decrease the infrastructure according to demand, keep expenses low since they are only increased if necessary and in a certain time.

Multi-AZ

Deploying the same infrastructure in different Availability Zones ensures that all services are always available to everyone.

Multi-Account Strategy

A multi-account strategy has been implemented to provide fault isolation. This ensures that any issues that affect one account do not affect other parts of the customer's environment.

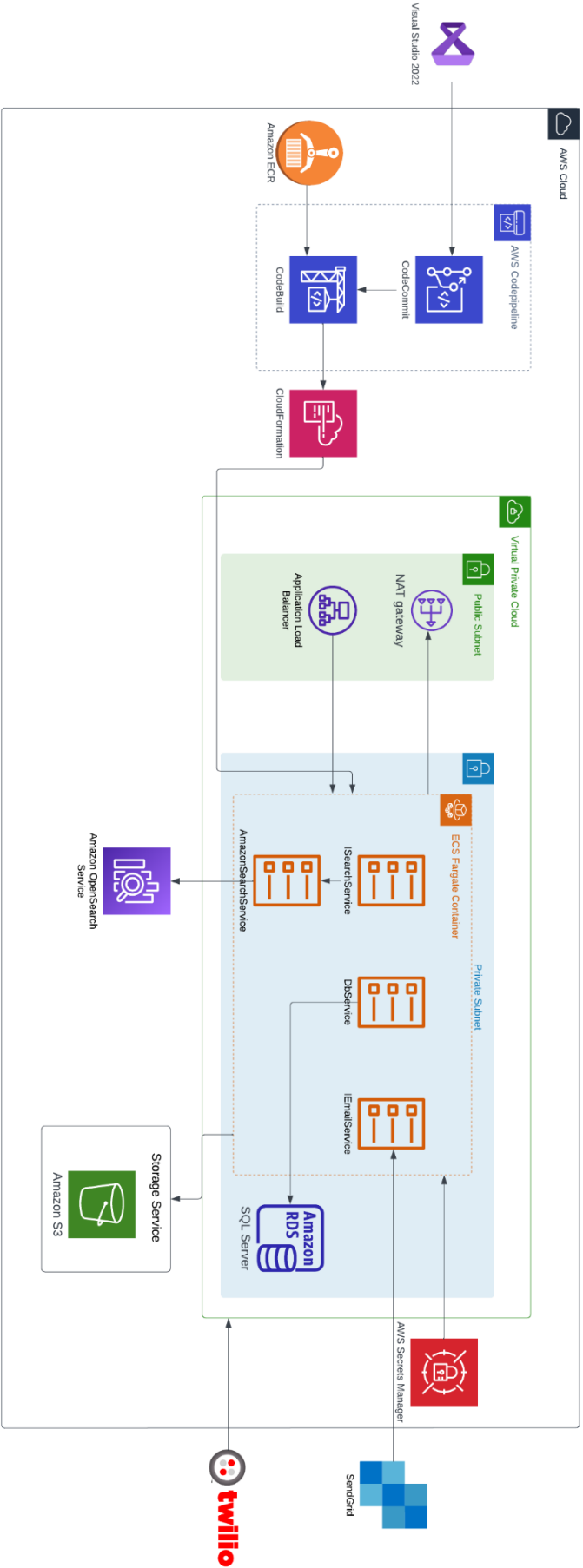
Safety

Encrypt all data to ensure that information is secure and only accessible to authorized subjects.

Monitoring

To ensure that the entire infrastructure is always up and when something goes wrong, it is necessary to continue monitoring all resources and have automatic responses to each event. Infrastructure services have automatic responses to failure events.

GoPanza High-Level Solution Diagram



Next steps

GoPanza now has a robust infrastructure with High Availability and auto-scaling, but it is necessary to add more protection to the infrastructure, making plans such as a Disaster Recovery in case the failures of the region keep its infrastructure in other regions or another service.

Comprehensive management service

AWS offers a wide variety of managed services that have preset configurations that they provide.

Autoscaling

Save money right sized at the right time, using only the necessary infrastructure.

Strong security

Replicate data across multiple zones, but always encrypt in transit and at rest.

About IO Connect Services

IO Connect Services is a company specialized in Information Technology Consulting Services. All of our team members have one thing in common: our enthusiasm for technology and our passion for excellence in customer service. We provide services throughout North America, LATAM, and Europe. We are headquartered in the New York metropolitan area, and we also have offices in Guadalajara, Mexico and Madrid, Spain.