Incremental search engine built using AWS.

PGS Software used a variety of Amazon Web Services to develop a highly performant search as you type engine for a widely recognised British multinational grocery and general merchandise retailer, which greatly increased overall user experience and helped to drive more sales.

BUSINESS NEED

The Client already had an internationally recognisable chain of highly successful bricks and mortar supermarkets. However, they decided to introduce an online shopping and delivery functionality into their booming business. They invested a significant amount of time in developing their e-commerce web application and having released it, they realised they needed to improve their product search engine.

The Client was looking to develop an incremental search engine, which would browse through tens of thousands of products in real-time, suggesting results as the user typed. The application would need to automatically generate ideally user-tailored suggestions and correct typos transforming them into the search item that the user was actually looking for. They also wanted to extend this new functionality to their 460,000 business colleagues – making their partners’ products easier to find as well.

The Client knew that by introducing the new search engine into their operations they would propel their business forward and increase overall turnover; however, they were facing a resourcing issue and lacked a skilled software development team who would develop the engine.

The Client decided to ask PGS Software to create the new incremental search engine from scratch, and the final result ended up exceeding their expectations. The development team delivered a fast, highly performant, and scalable solution.

SOLUTION

Before project development could begin, the PGS Software team needed to thoroughly analyse the Client’s existing software specifications in order to propose the most efficient and functional search engine model.

After having conducted a thorough analysis of the Client’s situation, it became clear that the development team would have to face the challenge of meeting very high non-functional requirements. They would also have to execute performance tests every code change. With these project aspects in mind, PGS Software developed the solution using Amazon Web Services, which turned out to be the best solution in terms of time and cost efficiency.

Firstly, the team developed an indexer, which catalogues Amazon S3 files on a daily basis. PGS Software used Amazon S3, the world’s most powerful Cloud object storage platform, which provides 99.999999999% durability and 99.99% availability allowing for the secure collection, storage, and analysis of the Client’s data. Using Amazon S3, allowed the development team to store and retrieve a massive amount of data from the Client’s website. The team stored the data in the ElasticSearch database as its flexibility, reliability, and automatic scaling to capacity needs, made it easier to manage the Client’s tens of thousands of data items.

The PGS Software development team created an entirely new expansive infrastructure, which was launched on the Amazon Virtual Private Cloud (VPC). Using Amazon VPC allowed PGS Software to instantly scale resources and to select Amazon EC2 instances types and sizes that perfectly suit project requirements while the Client only paid for the resources that were actually used – all within Amazon’s steadfast infrastructure.

Since the search as you type engine needed to process tens of thousands of products, the PGS Software team decided to use Amazon EC2 Auto Scaling. It dynamically scales EC2 instances in order to automatically increase their number during high website traffic times – which helps ensure the application remains highly performant at all times. Using Amazon EC2 also reduced costs as it automatically decreases capacity during low website traffic times. The team used Elastic Load Balancing to rapidly handle network traffic pattern changes and to deeply integrate with Auto Scaling.
in order to ensure sufficient application capacity regardless of application load. Everything was built on top of Kubernetes and Docker and high performance was achieved as a result of having used the cutting-edge Vert.x framework. The PGS Software team migrated some of the Client’s existing services to the AWS Cloud and used a **Continuous Delivery pipeline to automate infrastructure activity.** The team took active part in development strategy calls in order to create a migration plan and to help implement the Client’s existing functionalities on Amazon’s servers. They also conducted an internal AWS audit to further support the Client on their evolution to the Cloud. When the development team finished work on the search as you type engine, it turned out that the Client needed PGS Software’s technical help with certain other aspects of their existing solutions. The team was asked to maintain, further develop and change some of the Client’s other functionalities. **PGS Software improved the overall quality of the software development process** by introducing performance tests and an automatic test suite for existing functionalities. All these improvements were made possible thanks to using Continuous Delivery automation processes.

PGS Software helped the Client **meet their key business objectives** by developing a fully functional and highly performant search as you type API that can be used across multiple websites. Using Amazon Web Services to create new and improve existing functionalities made them **scalable, highly available, and cost-effective.** The numerous new features created by PGS Software easily adjust to meet the Client’s needs – and will continue to do so for years to come as the AWS solutions are **fully future-proof.**

**BUSINESS BENEFITS**

The PGS Software team developed a **highly functional** search as you type engine, which generates entire sets of search results in the form of suggestions that make it easier – and much faster – for the user to find what they’re looking for. The incremental search engine is highly performant as it **can manage up to 1,300 transactions per second** within (and not exceeding) 50 milliseconds.

The AWS-hosted infrastructure and **microservices** also greatly **increased release speed** as even if one application instance were to fail, none of the others would be affected – ensuring the application’s **features are available 100% of the time.** The solution is scalable, future-proof, highly available, and highly performant. PGS Software’s automated Continuous Delivery approach resulted in **zero-downtime deployments** – rendering the application immune to any potential faults.

The search as you type engine created is fully functional and **bug-free virtually all the time.** Its performance never wavers – it is equally fast and effective in high and low website traffic times. All of these consumer-oriented benefits contribute to the **highest quality of user experience** possible.

The incremental search engine also serves as a foundation, onto which many other additional functionalities can be added in the future. It can be **easily customised** to meet the needs of the Client’s various business partners and suppliers – increasing their, and the Client’s, revenue turnover.

In today’s technologically revolutionised world, patience is often a scarce commodity – that may be why the solution developed by PGS Software has greatly increased the Client’s business success. The search engine makes it so easy for the consumers to grocery shop that about 90% of the search effort is performed by the application and not the end user. Its smart incremental system reads and remembers the user’s preferences and previous consumer choices. Moreover, the **engine’s functionality speed is lightning fast** – it only takes 15 milliseconds (up to a max. of 50 milliseconds/1,300 transactions per second) for search result suggestions to pop up – **making shopping simple, quick, and easy.**

Using Amazon Web Services significantly lowered costs as the development team only used the resources that were actually needed. The team also reduced the time to market because Continuous Delivery enabled **automatic deployments** to be put into **production within seconds** – resulting in zero-downtime deployment – and contributing to the fact that the search engine is up and running virtually 100% of the time.

PGS Software delivered a highly available, reliable, scalable, and resilient solution – helping the Client significantly raise the quality of user experience and satisfaction – consequently leading to **more sales and happier customers.**

**PROJECT DETAILS**

**SOLUTIONS**
Scrum, Continuous Delivery, Agile, Code Review, Automated Testing, Peer Programming

**TECHNOLOGIES**
Java 8, Vertx.io, Spring, Spring Boot, Spring Batch, Junit with Mockito, Hazelcast, Elasticsearch, Kubernetes, Gatling, Cucumber, Amazon VPC, Amazon EC2 Auto Scaling, Elastic Load Balancing, Amazon S3, Amazon SQS, Amazon DynamoDB, Amazon RDS

**TOOLS**
Splunk, GitHub, Jenkins, Sonar, Ansible, AWS CloudFormation, Jira, Confluence

**TEAM**
5 backend engineers, 1 automation QA specialist, 1 Project Manager/Scrum Master
ABOUT THE CLIENT

**The Client** Client is a British multinational grocery and general merchandise retailer. They are one of the largest retailers in the world and have stores in multiple countries, across two continents.

ABOUT PGS SOFTWARE

**PGS Software** is a public listed IT development centre providing extended teams who develop custom software solutions and deliver end-to-end business services to clients worldwide. As a certified Amazon Partner Network (APN) Consulting Partner, we specialise in Cloud Transformation (Application Migration & Modernisation). We have 3 development centres in Poland (Wroclaw, Gdansk & Rzeszow) as well as branches in London, Munich, Vienna & Barcelona. We provide Agile-to-DevOps delivery capabilities such as B2B/B2C web & mobile development, Continuous Delivery, Business Analysis, UX & UI design.

FOR MORE INFORMATION ABOUT OUR SERVICES:
PLEASE CALL US AT +48 71 7982699 OR VISIT OUR WEBSITE WWW.PGS-SOFT.COM.