Case study:

GenAI in practice – Intelligent quality control on the production line

SERVICE / APPLICATION:

AI application supporting quality control in production.

FIELD:

FMCG (Fast Moving Consumer Goods)

DESCRIPTION:

Designing a GenAI-based solution for real-time analysis of the production line.

TIME FRAME OF THE PROJECT:

December 2023 – July 2024

AWS SERVICES USED FOR IMPLEMENTATION:

- AMAZON EC2
- AWS S3
- AI MODEL- YOLO

SOLUTIONS USED FOR THE IMPLEMENTATION:

- AUTOMATION
- GENAI
- INFRASTRUCTURE DESIGN IN AWS

1 Client

Our client is a company in the **FMCG industry**, specializing in the production of dairy products in plastic packaging. The company's factories are located across multiple states in the USA, with **yogurt accounting for 40% of total production.**

With ISO certifications and structured processes, the company conducts cyclical quality control. However, despite advanced standards, this process was primarily carried out manually by employees, leading to significant challenges.

2 Challenges

The client was looking for a way to automate and improve quality control, which had previously been performed manually by employees. Due to manual operations, the process generated:

- **High labor costs** associated with employee wages,
- **Time-consuming procedures**, requiring significant workforce involvement,
- **Increased errors** due to subjective employee assessments, leading to inconsistencies.

The company was also exposed to additional human errors, negatively impacting the final product quality.

2 Challenges

Beyond clearly identified issues, the client also presented several additional requirements for the GenAI implementation. The solution needed to:

- Analyze footage from **four cameras simultaneously**, covering four different production lines,
- Work with **various types of packaging, templates, and labels,** considering their diverse positioning on the production line,
- **Integrate with the management system** responsible for automatically removing defective or damaged products from the conveyor,
- Ensure **high security and efficiency,** with the ability to store processed data in the cloud.

In summary, the company needed a solution that would automate the process, enhance its objectivity, and reduce operational costs.

3 Implemented solutions

We started by developing a **GenAI and AWS-based solution.**

The key component was real-time image processing, implemented using a **Python-based application running on an Amazon EC2 instance**. The application utilizes the **YOLO model**, specialized in object detection, to identify damaged packaging.

We trained the YOLO model by **manually labeling damaged products in hundreds of images.** To increase analysis accuracy, we introduced **variability in training data**, such as rotating images and simulating different product positions on the conveyor. This enabled the model to recognize defects like **detached lids or holes in packaging,** regardless of their positioning.

3 Implemented solutions

Visual data is stored in an **Amazon S3 Bucket**, ensuring reliable video stream storage from **four cameras operating simultaneously across four production lines**. The use of Amazon S3 guaranteed system stability and high performance, allowing for the real-time handling of large data volumes.

The implemented system was also integrated with the **existing production line management infrastructure**. Upon detecting a defective product, the application automatically sends an **alert to the operator** and transmits data via API to the conveyor system. This enables **automatic removal of defective products** from the production line **without human intervention**.

Additionally, the system provides **a high level of security**, and its architecture allows for **scalability**, enabling the addition of more cameras and expansion to other production lines.

We used the following technologies:

Amazon EC2

AWS S3

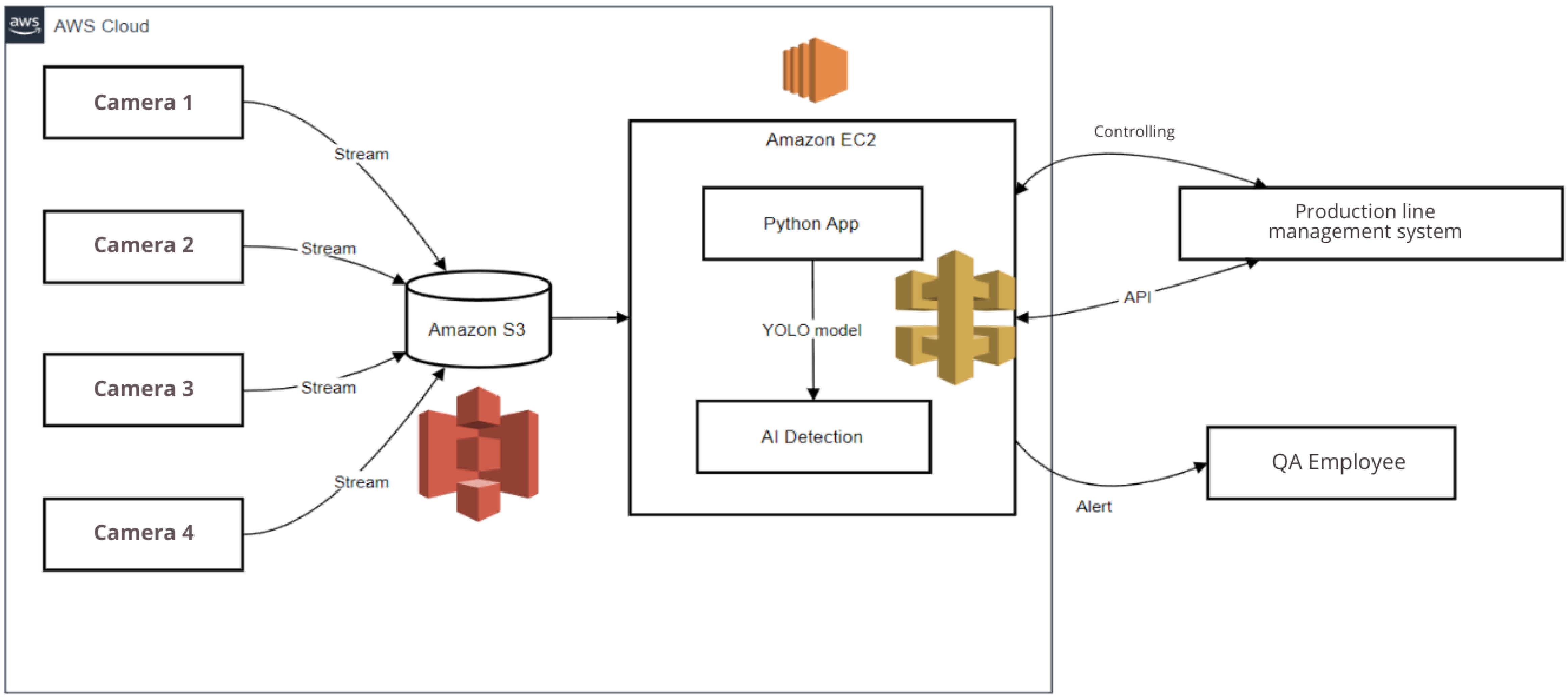
Python

AI Model: YOLO

Google Meet

Easy Redmine

4 GenAI application architecture diagram



5 Achieved effects

The implemented solution delivered significant benefits, including:

- **Lower operational costs** by reducing manual quality control efforts,
- **Eliminating subjective assessments**, ensuring consistent quality control,
- **Increased inspection speed**, optimizing the production line's operational time,
- **Minimized error risks**, as the system detects even atypical packaging defects,
- **Scalability**, allowing adaptation to various packaging types and production lines.

6 Results

During the **GenAI testing phase**, the client confirmed that the solution met all their expectations. The full deployment proceeded with confidence and the results validated this certainty. The quality control time was **reduced by half**, significantly improving production line efficiency.

It is also worth emphasizing that the implementation of this solution **did not lead to job reductions.** On the contrary, by automating routine tasks, employees were able to focus on more advanced and strategic activities, such as laboratory work or overseeing other production areas. This allowed for **better utilization of human resources and expanded production capacity.**

Contact us

LCloud Sp. z o.o.
Złota 59
00-120 Warszawa

+48 22 355 23 55

kontakt@lcloud.pl

Fast contact:

biuro@lcloud.pl

Business:

sale@lcloud.pl
+48 22 355 23 57