

Real-Time AI Object Detection for Conveyor Safety

About the Client

The client is a **British recycling company** operating industrial waste processing facilities. The company processes large volumes of recyclable material using conveyor-based sorting lines and aims to improve **operational safety** and **reduce unplanned downtime**.

The business is established in the UK market and operates industrial infrastructure where safety and reliability are critical to daily operations.

Description

Recycling conveyor lines are **exposed to hazardous foreign objects** (e.g., batteries, gas canisters, metal parts) that can cause fires, explosions, equipment damage, and safety incidents if they enter the wrong processing stage. Operators **cannot reliably detect these objects manually in time** because the conveyor moves fast and visibility conditions vary.

As a result, the client needed **a solution that reduces risks and improves safety** by **detecting dangerous objects early**, enabling either an automatic stop of the conveyor line or immediate operator alerts.



Duration

3 months



Location

United Kingdom



Team Composition

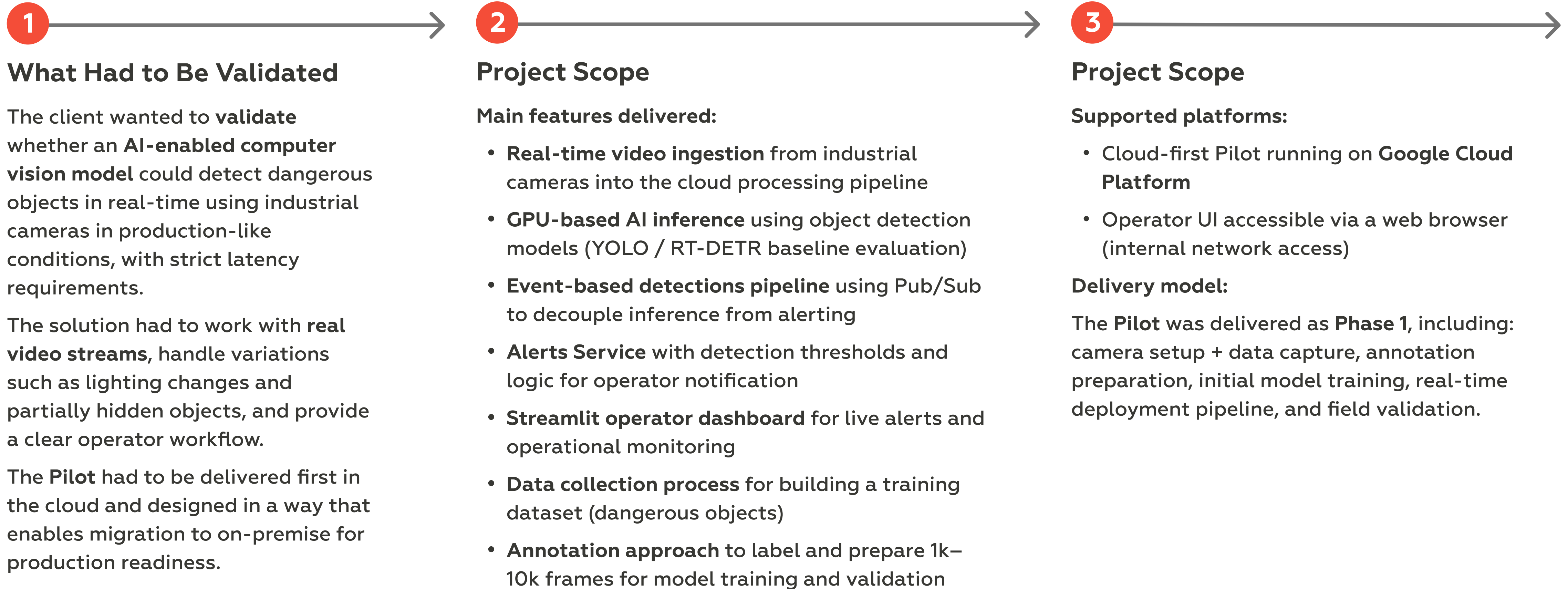
- Senior ML Engineer
- Python Developer
- Business Analyst
- Project Manager
- Architect



Industry

Recycling, Waste Processing

Project Overview

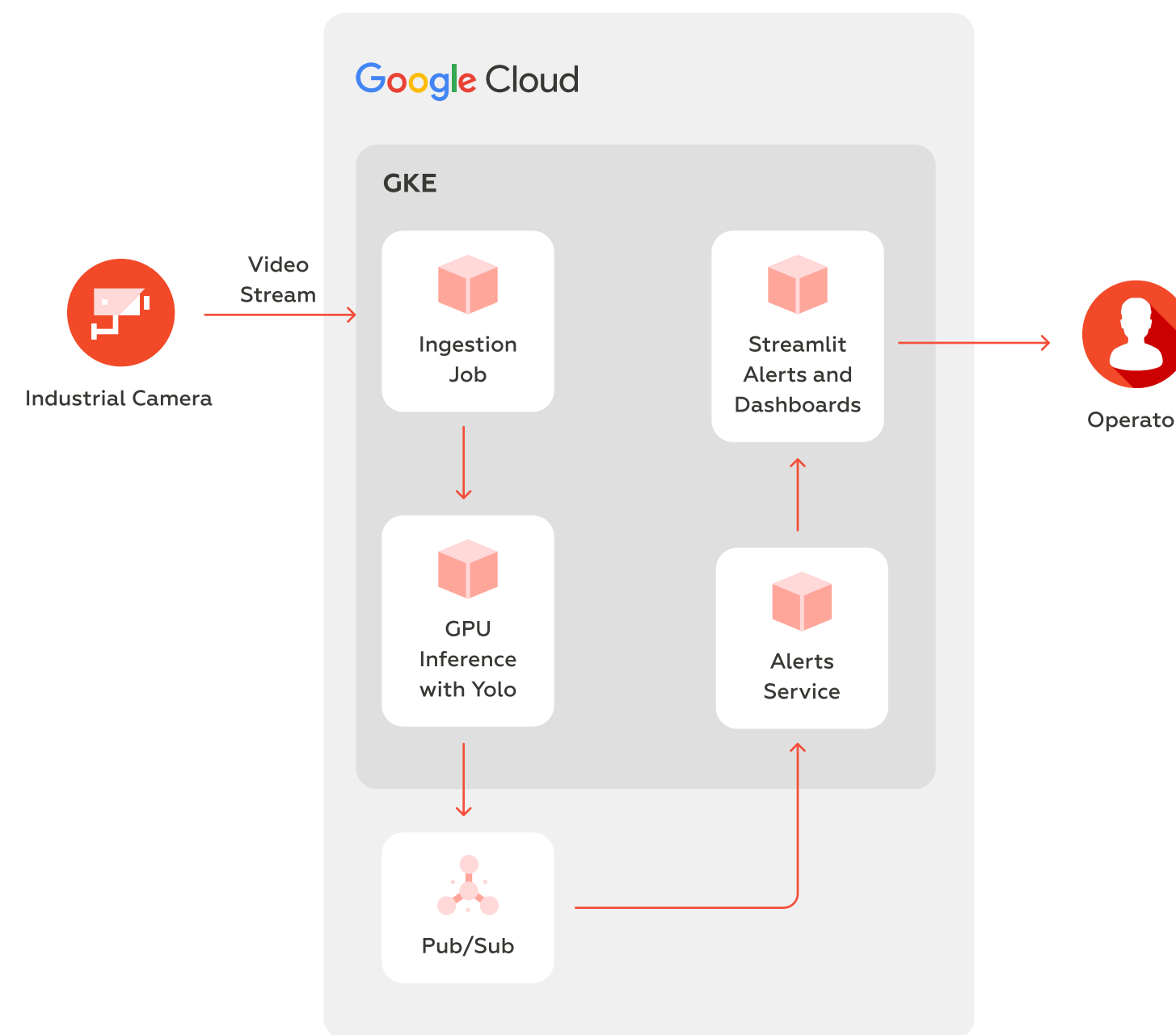


Solution Overview

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Architecture and Workflow

1. **Industrial Camera → Video Stream.** Industrial cameras provide a live stream from the conveyor line.
2. **GKE Ingestion Job.** A dedicated ingestion component running on GKE receives the stream and prepares frames for inference.
3. **GPU Inference with YOLO (GKE).** A GPU-enabled inference service runs YOLO detection on frames in real-time and produces detection outputs.
4. **Pub/Sub (Detection Events).** Each detection event (object type, confidence, timestamp, camera reference) is published into Pub/Sub to decouple inference from downstream services.
5. **Alerts Service (GKE).** The Alerts Service subscribes to Pub/Sub, applies thresholds and alerting logic (including suppression rules), and generates operator-ready alerts.
6. **Streamlit Alerts and Dashboards (GKE).** A Streamlit-based UI provides operators with real-time alerts and dashboard views for monitoring detection events.
7. **Operator Response.** Operators receive immediate visibility into detected hazardous objects and can take action (e.g., manual stop or process adjustment).



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Solution We Delivered

We delivered a **cloud-based real-time computer vision Pilot** that detects hazardous foreign objects on a recycling conveyor. The solution **processes live camera video streams**, performs GPU-powered inference using YOLO, and triggers alerts through an event-driven architecture.

The system was designed to **reduce safety incidents and downtime** by ensuring that operators receive alerts early enough to respond, and by allowing for future expansion to auto-stop conveyor functionality.