

Carbon Capture Technology Solution

A cloud-based industrial IoT solution designed for real-time data processing and communication using MQTT for efficient IoT data transfer, Docker for deployment flexibility, and Solara with FastAPI for seamless IoT cloud integration. Built for reliability and scalability on Google Cloud Platform (GCP).

Backend Development

Biotechnology

Cloud



Client*

A British biotechnology startup specializing in industrial-scale carbon capture solutions. The company leverages bacteria to capture CO2 and transform biomass into valuable compounds, making carbon capture utilization cost-effective and sustainable.

*Due to NDA restrictions, specific client details and case study insights cannot be disclosed.

DURATION
2023 – 2024 (8 months)
TEAM
5

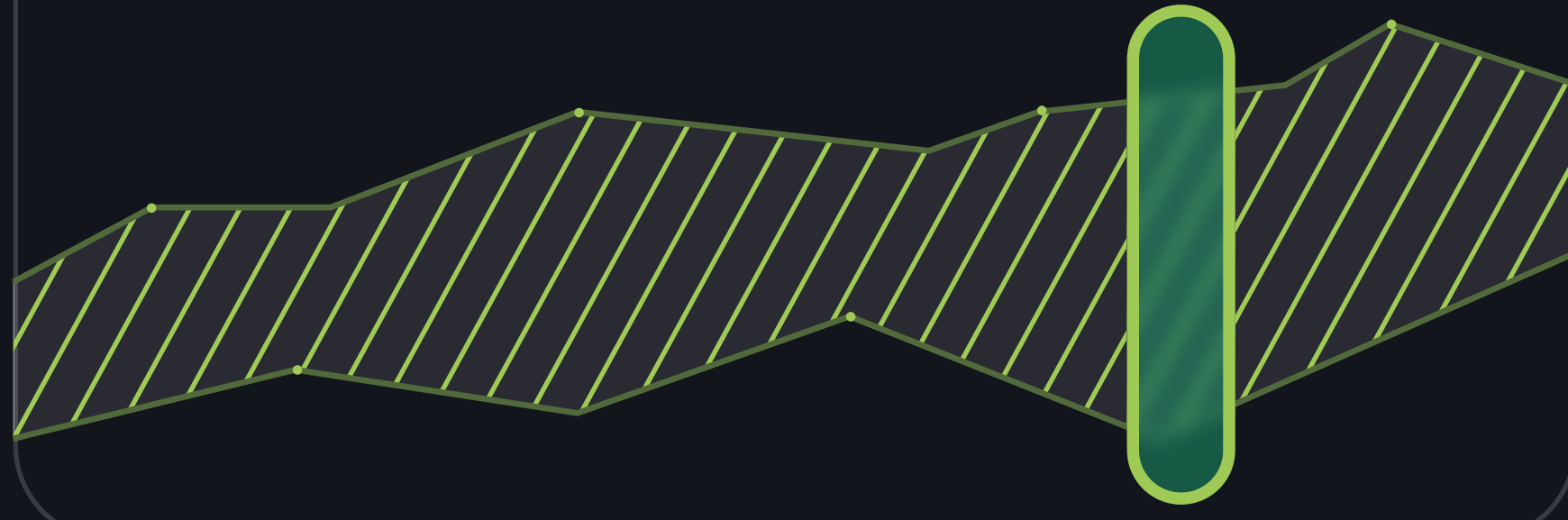
The team involved in the project

INDUSTRY
Biotechnology

SOLUTION
IoT Data Management (DMS), API, Cloud Integration

TECHNOLOGIES
Python, MQTT, Docker, Solara, FastAPI, Google Cloud Platform (GCP), PostgreSQL, SQL and SQLAlchemy

- 2 x Developers from the client side
- 3 x Python backend engineers



Challenge

The client faced challenges in implementing an industrial IoT solution capable of managing reliable, real-time data transfer while ensuring scalable cloud deployment. With limited experience in deploying production-level applications, they required a secure, lightweight communication protocol and an efficient cloud infrastructure to support industrial IoT and carbon capture utilization.

Related objectives



Manage data communication between devices



Secure data transfer

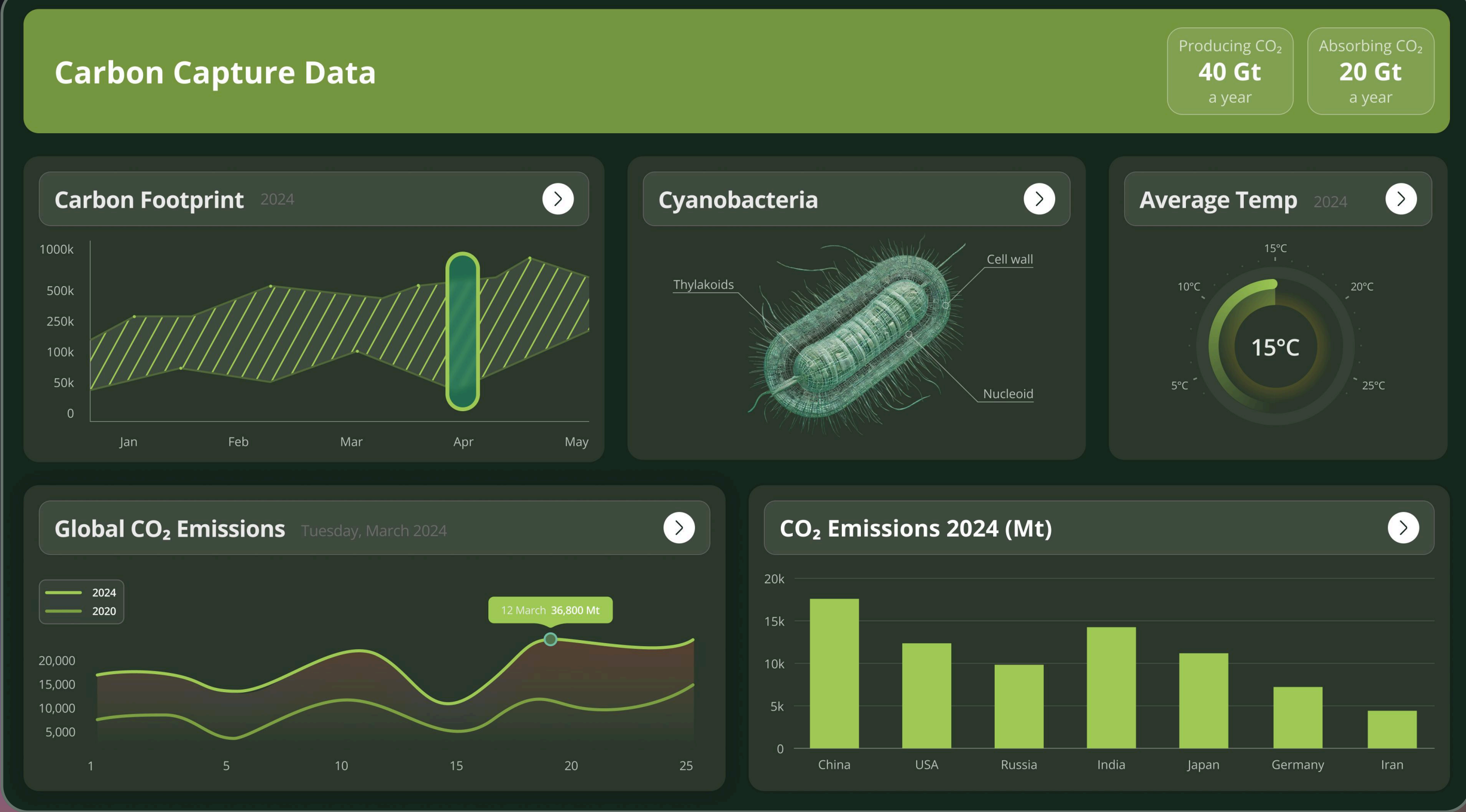


Ongoing support

Solution & Functionality

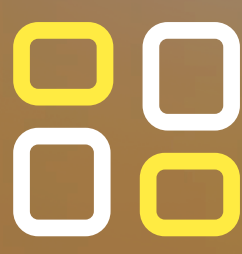
Timspark provided expertise in IoT data communication and real-time command execution, implementing an MQTT broker for reliable, lightweight data transfer. Our solution included Docker-based infrastructure, enabling cloud-based industrial IoT scalability on GCP.

Our developers at Timspark leveraged Solara and FastAPI to streamline efficient application development for the client, while integrating Looker to enhance data visualization for monitoring industrial IoT and carbon capture utilization. Through continuous support, we ensured long-term scalability and optimized production processes for the client's needs.



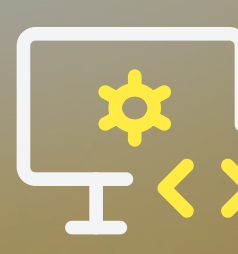
Looker

Template dashboards and reporting using Looker and GCP.



Dashboard

The dashboard is dockerized and optimized for performance, providing a faster and more reliable solution for real-time data processing.



Backend

The backend involves the optimization of IoT infrastructure, dockerization of cloud and local infrastructure, implementation of a caching server, and deployment of the pipeline to GCP.

Results and business value

The implemented IoT communication system drastically improved the client's ability to handle real-time data processing, enabling seamless IoT data transfer between industrial devices. By leveraging MQTT, Docker, and FastAPI, the solution enhanced scalability, security, and cloud readiness, positioning the company for long-term growth in carbon capture utilization and storage (CCUS).

The solution enables secure, real-time IoT communication through MQTT, ensures cloud-based scalability using Docker and GCP, and delivers efficient management of industrial IoT data.

The implementation enhanced analytics and monitoring capabilities via Looker dashboards, while ensuring long-term reliability through continuous support and ongoing feature enhancements.

Do you have a similar project idea?