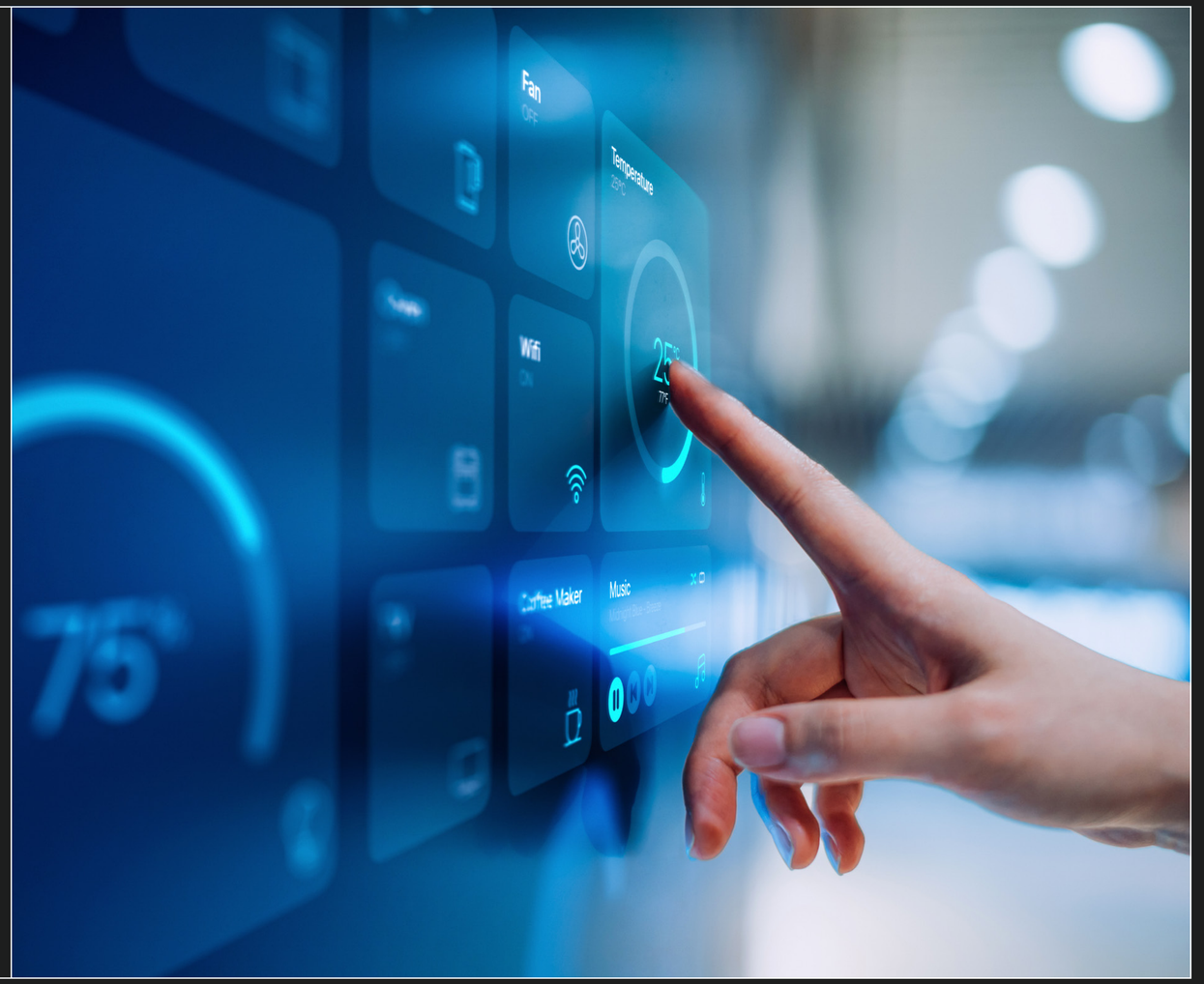
infopulse

Case for **a Global Industrial Goods Manufacturer**

A Cutting-edge Embedded Device Helps a Global Manufacturer Revolutionize Transport Refrigeration_

Industry: Manufacturing **Location:** Europe **Employees:** 30,000+



Client Background

Our client is a top-tier manufacturing enterprise that delivers a diverse portfolio of industrial solutions and services for the commercial, residential, and transportation sectors. The company is a leading producer of heating, ventilation, and air conditioning (HVAC) equipment, refrigeration systems, and smart facility management solutions.

Executive Summary

Goals

The client aimed to transform its obsolete refrigeration unit controller into an intelligent device with a broad spectrum of innovative features

Solution

Infopulse engineered a custom embedded device that serves as a communication cornerstone between the unit controller and the client's cloud-based environment, while also amplifying the controller with new smart capabilities

Benefits

A basic unit controller evolved into a powerful next-gen device that is in a league of its own, empowering the client with optimized costs, facilitated compliance, better customer experience, and a unique value proposition.

Services delivered

Custom Software Development, Software Quality Assurance, DevOps

Business Challenge_

One of the client's major business pillars involves the production and management of refrigeration units for trucks that are designed to ensure the safe delivery of fresh foods, medication, and other perishable items. Each refrigeration unit has multiple sensors and one core device – a custom controller that monitors and maintains the unit's internal temperature.

The majority of the client's controllers were based on a legacy tech stack and had limited functionality, which no longer satisfied the company's business needs. Thus, a range of challenges had to be addressed:

- Excessive efforts of the client's fleet managers, who had to constantly monitor the movement of trucks across different geographical zones and adjust the unit parameters via SMS.
- Costly and time-consuming controller updates, which were conducted manually and required the on-site presence of engineers.
- Absence of controller features that would help to comply with country-specific environmental and legal requirements, such as noise regulations or limited bans on diesel-powered vehicles.

As a pioneer in the field of transport refrigeration, the client had a myriad of ideas on how to improve the unit controller with new cutting-edge capabilities. Yet, the company could not rapidly engineer and deploy new features due to the lack of in-house embedded development experts.

The global manufacturer started searching for a reliable IT partner that would help to transform the refrigeration unit controller into an intelligent next-gen device. Eventually, Infopulse was chosen for our in-depth embedded development expertise that exceeded the client's expectations, as well as the ability to quickly ramp up a team and jumpstart the new ambitious project.

Solution & Business Value_

Infopulse developed a custom embedded device for the top-tier manufacturing enterprise that serves as a communication intermediary between the refrigeration unit controller and the client's cloud-based environment. The device collects all telemetry data inside the unit, monitors the work of the controller, and makes it perform the programmed logic.

As a result, the controller was modernized and enhanced with a broad spectrum of tailor-made features, which brought the following benefits for the client:

- Fully automated temperature control and maintenance inside refrigeration units, which relieves the client's fleet managers from tedious work and does not distract the drivers.
- Reduced noise pollution in residential areas with a time/location-sensitive smart configuration feature that limits the engine power of a truck.
- Reduced time, effort, and costs for updating and maintaining unit controllers, as the process is now fully remote and automated.
- Streamlined compliance with environmental/legal requirements along with optimized fuel consumption thanks to automated switching between the truck's diesel-powered engine and the electric motor.
- Minimized risks of theft, spoiled perishable products, and disputes between customers and carriers as the truck movement and refrigeration unit opening/closure can be monitored via an operator's panel.
- Immaculate controller performance was ensured by custom-tailored automated test scenarios and a dedicated CI pipeline.

The client has deployed 1,500+ new unit controllers and continues collaborating with Infopulse to further advance the device. Ultimately, the manufacturing giant strengthened its competitive advantage and created a unique value proposition with an exclusive refrigeration unit controller that has no counterparts on the market.

Technical Details

After discussing the key business and technical requirements and gaining insight into the client's operations, Infopulse conducted an in-depth assessment of the existing IT landscape, including the firmware and hardware.

During the initial stage of the project, Infopulse developed a custom embedded device that is connected to the refrigeration unit controller via a CAN protocol. The device acts as a cornerstone that connects the controller with the client's cloud-based environment and allows the execution of the programmed logic. Subsequently, our team designed and implemented new basic functionality for the controller, which served as the basis for future advanced capabilities.

Over time, Infopulse has earned the client's trust and took full responsibility for the embedded development practice, while the manufacturer's in-house team focused on strategic planning, as well as business and requirements analysis. Our team worked on numerous major project segments, covering multiple aspects of the device.

Development of Advanced Controller Features

- Collection of all telemetry data from the vehicle sensors and its subsequent transfer to the cloud.
- Activation/deactivation of refrigeration, automated adjustment of the temperature, and its maintenance in the required state (linear or sine waves).
- Conversion from the diesel combustion engine into the electric motor or vice versa in hybrid trucks, as well as an option to enable or disable full-speed modes.
- Bluetooth-based connectivity between the controller and the client's proprietary mobile app to let truck drivers check and configure the settings of the refrigeration unit.
- Automated remote firmware updates via the cloud-based server.

Communication with the Cloud-based Environment

Infopulse developed a custom logic that aggregates all the telemetry data from the refrigeration unit and transfers it to the client's cloud-based server. There the data is processed, visualized, and used to build advanced analytics. Likewise, our experts designed the logic that enables reverse responses from the cloud to the controller, as well as the processing capabilities that let the device perform the required actions.

Operator's Panel Improvement

The client's refrigeration trucks have an operator's control panel mounted on them. The manufacturer's customers (namely their drivers, logisticians, or other responsible parties) can use the panel to configure the temperature settings for specific perishable items and monitor the condition of the refrigeration unit. In addition, the client's cloud-based server stores the data related to the truck movement, stops, when the refrigeration unit was opened, for how long it remained open, and at what time it was closed.

The software for the operator's panel was developed by a third-party vendor, and after assessing its performance, Infopulse found a range of defects and bugs. Once all issues were detected, our team gave expert recommendations on how to fix them, thus helping the client ensure the seamless functioning of the panel.

Automated Software Testing & Continuous Integration

At the beginning of the project, the Infopulse team only conducted functional and unit tests to evaluate the logic of the new controller features. Consequently, our team designed a tailored automated testing approach based on custom frameworks to assess the software logic. To be more precise, our QA experts designed automated test scenarios that simulated user behavior (pressing specific buttons) and the following response of the embedded device (execution of the programmed commands) to ensure that everything works as expected.

In addition, Infopulse helped the client implement the continuous integration (CI) practice. Our experts used Jenkins to enable automated builds and tests that allow to detect code conflicts and prevent defects prior to deployment.

Technologies & Tools_

C

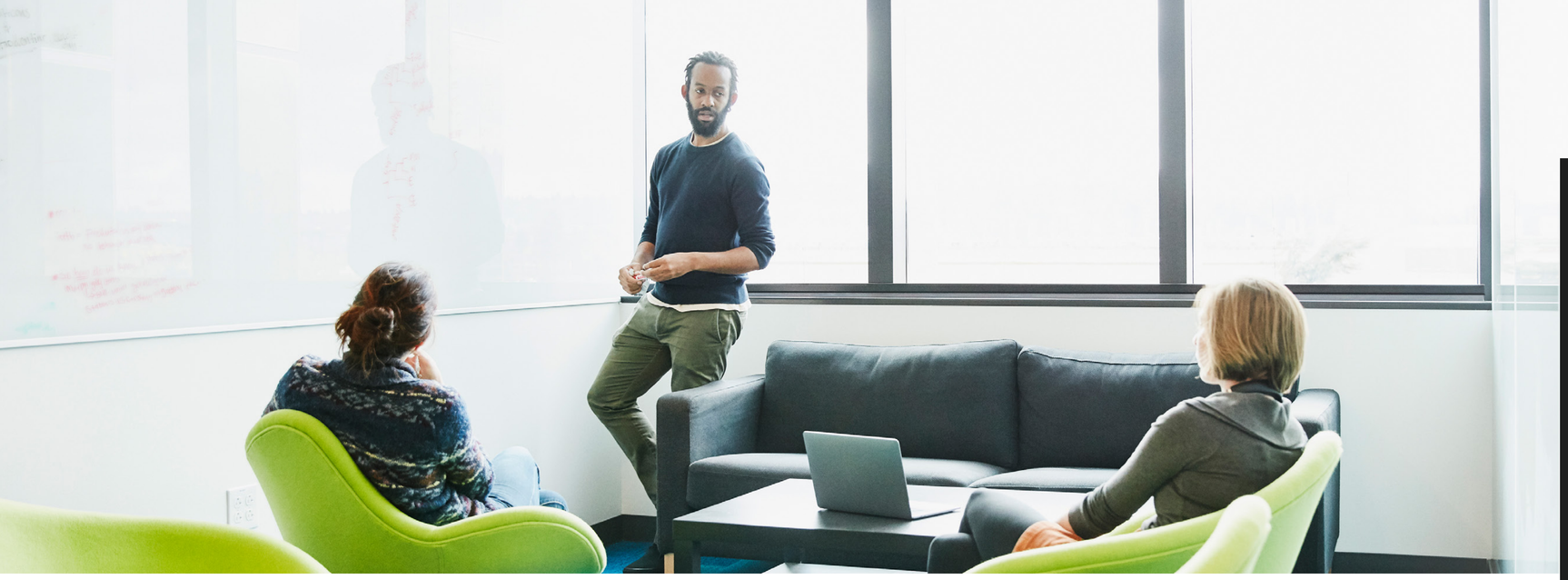
Python

Linux

Bluetooth

Jenkins

SCRUM



About Infopulse

With 30+ years of IT experience, Infopulse provides expert custom development services that cover the entire SDLC, from ideation to full-cycle solution engineering. Having developed hundreds of successful custom IT solutions for SMEs and Fortune 100 companies across Europe, Asia, and the USA, we address the individual and business needs of our clients and their end-users.

Our experts have profound experience in developing embedded and M2M software solutions for the manufacturing and automotive industries. In addition, Infopulse provides IT architecture and software product modernization, along with a holistic suite of software quality assurance services, including QA consulting, strategy development, and process improvement.

We can also help you access the benefits of DevOps with a full spectrum of dedicated services, including consulting, CI/CD, container orchestration, release management, and DevSecOps.

Infopulse is trusted by many established brands, such as Bosch, Metinvest, Zeppelin, Allianz Bank, BICS, Credit Agricole, Delta Wilmar, ING Bank, Microsoft, Offshore Norge, OLX, OTP Bank, Santander, SAP, UKRSIBBANK BNP Paribas Group, Vodafone, and others.

For more information, please visit **www.infopulse.com**

Contact us

PL +48 (221) 032-442

DE +49 (69) 505-060-4719

US +1 (888) 339-75-56

UA +38 (044) 585-25-00

BG +359 (876) 92-30-90

BR +55 (21) 99298-3389

info@infopulse.com