GenCell

Hydrogen Fuel Cell System

Fueling a New Era In Humanity's Tomorrow

Powered by:

macchina.io

IoT Technology Stack

A Compact Hydrogen Fuel Cell System

In a fast-paced world, GenCell stood out with a plan to change and revolutionize clean energy. They aimed to develop a cutting-edge hydrogen fuel cell system that would give us all a better future.

This system converts hydrogen gas into electricity, providing a clean power source for applications such as electric vehicle charging, off-grid power and backup/emergency power.

> We based our edge IoT on macchina.io EDGE SDK to allow rapid development and fast go-to-market. This decision has proved itself, as our development team evolved it into a full featured edge EMS platform.
>
> Haim Moshe,
> VP Customer Services GenCell
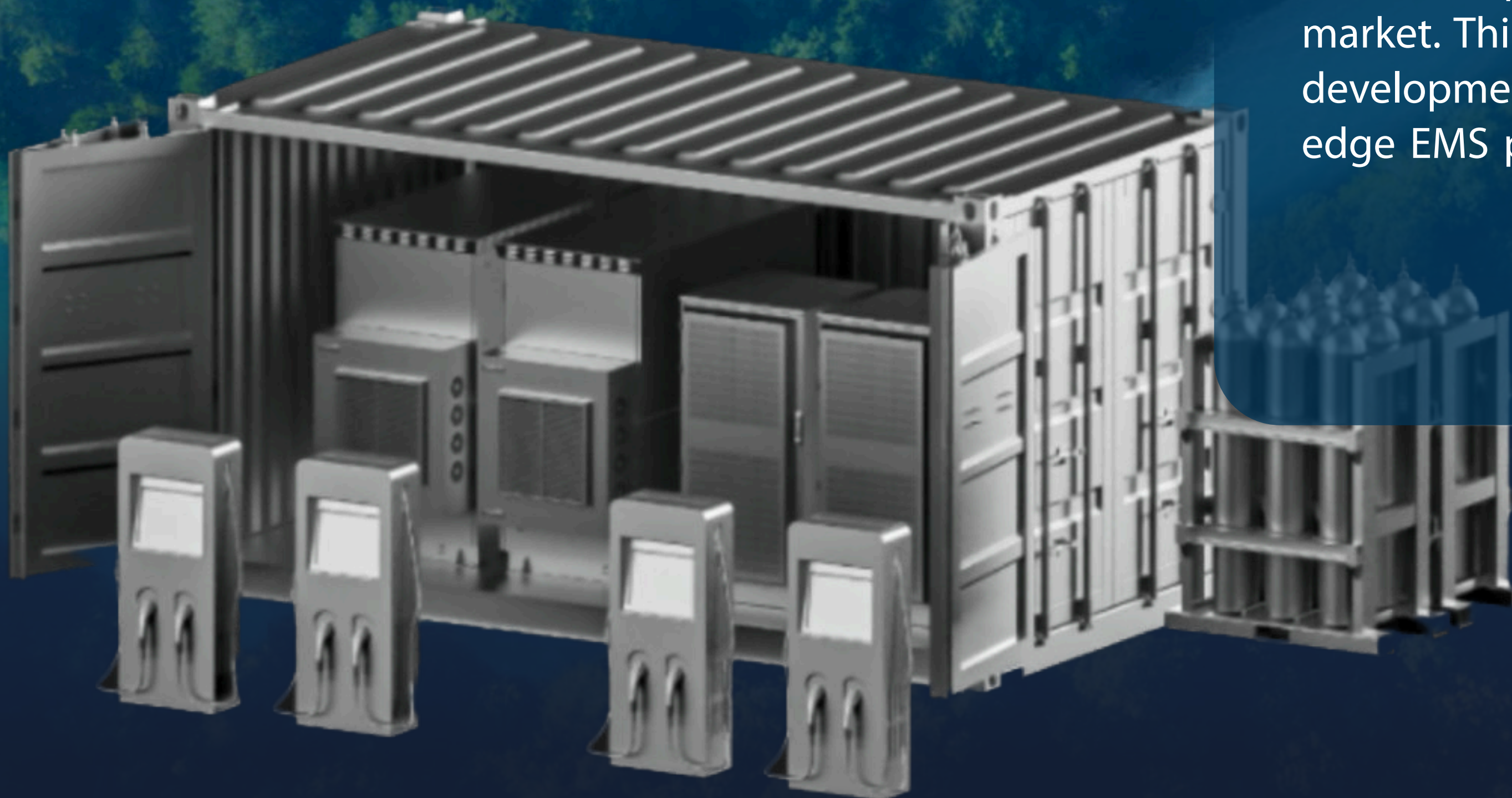
Data Acquisition and Decision Making

1 The system needs to gather real-time data from the fuel cell controller (PLC) and various sensors.

2 Based on this data, it must make real-time decisions to optimize performance (e.g., reducing power output if the temperature is too high).

3 These decisions are made on the machine itself (edge computing) and are then commanded to controllers that manage the system.

The fuel cell itself is controlled by a PLC. However, the system also needs an additional computing system for various tasks, including:

■ Collecting and logging data and events from the PLC and additional sensors.

■ Processing that data, including computing additional parameters from the available data.

■ Visualizing the parameters in a web interface.

■ Rule processing, based on configurable rule sets.

■ Generating notifications (e.g., via SMS, Email or Telegram) and alarms if an abnormal condition is detected.

■ Interfacing the system with its environment. Customers must be able to retrieve parameters, as well as control the power generator (e.g., power it on or off) via various interfaces, including Modbus MQTT or domain-specific protocols like DNP3.

THE CHALLENGE

Initially, the GenCell team was very ambitious and inclined to build everything in-house. But soon the analysis of the risks and efforts quickly led to that idea being abandoned.

Building from scratch meant significant time and resources spent on commodity features like authentication and communication protocols like Modbus or MQTT.

Realizing the potential setbacks, they pivoted.

GenCell tasked Pluggable with building a new solution that should be more cost effective, more reliable and easily adaptable to future requirements. This process started with an evaluation of various software frameworks, out of which macchina.io EDGE was selected. Reasons for the selection of macchina.io EDGE were:

LOW FOOTPRINT

macchina.io EDGE's efficiency and low footprint allows the software to run on a low-cost IoT gateway device.

FLEXIBILITY

macchina.io EDGE's flexibility, adaptability and extensibility allowed GenCell to build a system that best fits their unique requirements.

JAVASCRIPT

JavaScript support in macchina.io EDGE allows the development team to build most of their custom application software in JavaScript.

SUPPORT

The macchina.io EDGE development team helped the project team by building custom features, as well as with troubleshooting.

macchina.io EDGE Features Used

Datapoints
The macchina.io EDGE datapoints engine is used to manage all the data acquired from the PLC, external sensors, as well as any "synthetic" values (computed from other data). The system has 100s of datapoints.

Connectors
Datapoints are made available to external systems via a number of connectors. Connectors are implementations of various communication protocols that directly work with datapoints. No additional coding required.

JavaScript Engine
The JavaScript engine was used to build an event-driven highly flexible rule engine. This makes the system easily adaptable to new requirements, as many aspects of the system can be controlled by configuration data and rule sets, without having to modify the application code.

Protocols & Services
The system also used the protocol and service implementations provided by macchina.io EDGE, including the Modbus TCP/RTU protocol, MQTT, HTTP, as well as support for sending emails and SMS messages.

Web Application Server
The custom web UI of the system is powered by the web application server integrated in macchina.io EDGE.

MACCHINA.IO
EDGE

macchina.io REMOTE Features Used

Remote Access to Web User Interface

macchina.io REMOTE gives access to the web user interface of the IoT edge gateway running macchina.io EDGE and the custom GenCell application.

This is available for both end users and support personnel.

Remote Access to System Controller (PLC)

Technicians can connect to the controller of the remote system via macchina.io REMOTE, directly from their service application, for maintenance and troubleshooting.

Remote SSH

Shell access (SSH) to the edge gateway is enabled for troubleshooting purposes, especially during the development phase.

Users and Permissions

Fine-grained control over the devices and ports a user may access.

MACCHINA.IO
REMOTE

The Results

Thanks to the lean architecture (macchina.io EDGE), hardware costs were reduced by 75 %.

75%
Cost Reduction

1 Instead of just a gateway, a **complete energy management** system, based on macchina.io EDGE and REMOTE technology, was delivered in under a year.

2 Possibility to remotely access the local UIs and deeper connectivity (e.g. file transfer via SSH) for technicians. No project delays due to the proven technology of macchina.io.

3 Future proof architecture as additional data points and features can be added easily and the solution is ready to use for complex edge computing and IIoT applications within the cloud.

4 The edge application manages over 30 system components **autonomously** and can connect to the internet for data transfer to the cloud and remote management.

"

macchina.io REMOTE enables seamless secure access to our H2 generators, with automated device registration and connectivity test integrated within our assembly line.

Gal Netzer,
GEMS Product Manager GenCell

"

macchina.io REMOTE

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macchina.io EDGE

Learn more >   Get started >

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