COLD-CHAIN MONITORING OF VACCINES IN VEHICLES AND BUILDINGS

A success story from KoolZone and Robustel

About KoolZone

KoolZone was founded in 2015 in Germany and now has its global headquarters in Henley-on-Thames in the UK.

Originally focusing on monitoring refrigeration temperatures as a disruptor to the manually intensive practices employed by the food sector to meet food safety standards, it soon became apparent that MaaS (Monitoring-as-a-Service) using plug-and-play long-range wireless technology (LoRaWAN) was the key to safety, compliance, and cost reduction across a wide range of industries.

KoolZone's wireless, cloud based monitoring solutions are now installed in many locations across four continents, monitoring healthcare, pharma, life sciences, universities, food and drink, and supply chain systems. Most recently, Koolzone has worked with the Jenner Institute - home of the Oxford-AstraZeneca vaccine - in monitoring both the development of the vaccine and also storage of the Covid-19 virus.

KoolZone specialise in the monitoring of cold storage conditions in fixed laboratory and hospital locations and vehicles in transit. KoolZone monitors temperature in medical-grade fridges and freezers, including -80°C ULT (Ultra Low Temperature) freezers and liquid nitrogen tanks, as well as electrical power supply.

KoolZone currently has over twenty sensor types which monitor pressure, humidity, C02, power, energy, leaks, events, GPS, and temperatures ranging from -200°C to +1,300°C for small businesses and multinational corporations alike.

Solution Topology

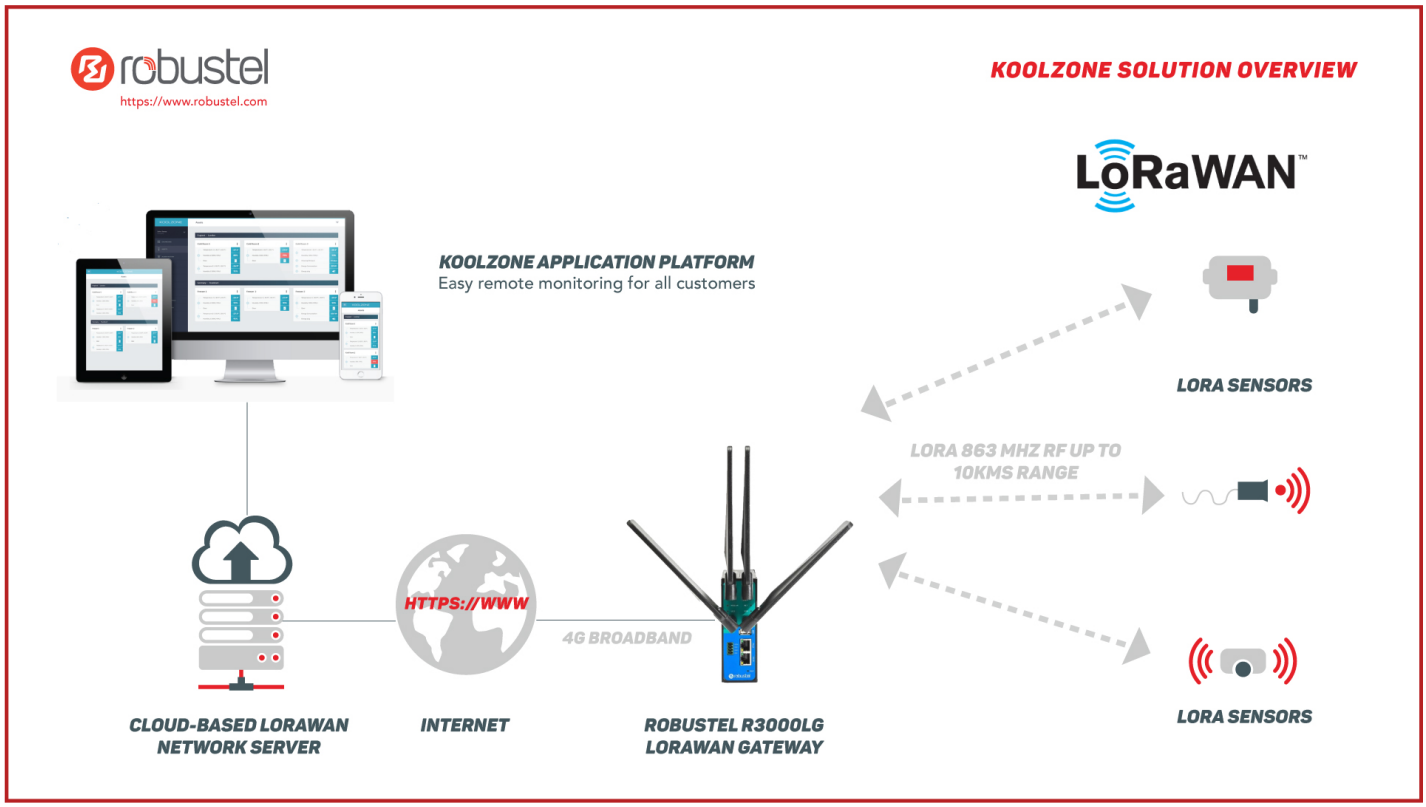

Figure 1.1 – KoolZone's LoRaWAN-based solution architecture

Solution Overview

At the heart of KoolZone's proposition is the ability to measure extreme temperatures in hard to reach places. Koolzone's industry leading Qwantum sensor, a high-precision, high-reliability sensor designed by the KoolZone engineers, employs BS EN 60751 compliant platinum resistance probes accurate to ± 0.4°C which can be supplied with a UKAS calibration certificate.
Installation is very simple - just place the sensor inside any controlled environment, and it will auto-pair with the Robustel LoRaWAN gateway. The sensor has a battery life of three to seven years depending on the sampling period and can measure temperatures down to -100°C. It is housed in durable food-safe plastic and can manage both data logging and history retrieval with an extended LoRaWAN rejoin policy.

Gateway

The R3000-LG LoRaWAN Gateway forms a bridge between sensors in the building and the internet. Reliable operation is essential and thanks to Robustel's industrial heritage and highly stable operating system, the R3000-LG will continue to work unattended for years on end. In case of network issues self-recovery mechanisms are in place and the entire estate can be monitored through the Microsoft Azure hosted cloud platform and RCMS (Robustel Cloud Management System).

R3000-LG LoRaWAN Gateway

- 8 channel LoRaWAN interface
- Rugged and durable housing and connectors
- Free cloud management platform
- Smart Roaming for enhanced Roaming SIM management
- Fully programmable OS with an SDK
- Wide operating temperature range

KoolZone Platform

KoolZone offers monitoring-as-a-service, with all data collected from KoolZone sensors securely and in real-time. The data is accessible in clear and easy to configure reports, which can be accessed via any browser from, any device. Real time alerts and reminders can be sent to users by text, phone call, or email and these are only triggered when there is a problem with data values falling outside of a pre-defined range.

Auto-generated, error-free and legally compliant reports can be set up so users save time, save money, and maintain compliance.

Business Challenge #1: Installing Sensors Inside Fridges

Fridges and freezers are faraday cages – which means they block electromagnetic fields - so for instance, traditional WIFI or Bluetooth connections will almost certainly be completely blocked by a typical fridge.

Equally it is not desirable to break the integrity of your fridge/freezer by having wires inserted through the seal to allow an electrical connection to a sensor placed inside.

KoolZone sensors use powerful long range (LoRaWAN) wireless communications, which easily transmit data through the walls of freezers to the Robustel LoRaWAN gateway, which acts as the receiver for one or several sensors.

The sensors are placed inside the freezer, typically at the top, to monitor maximum temperature and can either be adhered to the wall or placed in the upper most drawer.

KoolZone's sensors also have a battery life of seven years at -80, which results in low servicing costs.

> *The partnership between KoolZone and Robustel means that we are able to reliably and securely monitor the valuable contents of freezers in all environments.*
> *Clients who have deployed our solutions have peace of mind 24 hours a day, 365 days a year. We had a -80 that went down recently. No one was on site at the research laboratory but we were able to quickly recover the contents, avoiding all losses.*
>
> **Steve Miller, Managing Director KoolZone Ltd.**

Business Challenge #2: Reliability of 3G/4G Communication

Roaming SIMs are often sold as a way to improve 3G/4G reliability, but whilst the fundamental premise is accurate, standard LoRaWAN Gateways do not always achieve the best results when using roaming SIMs due to suboptimal behaviour of "automatic network selection."

In short, you can pay extra for the resilience of a multi-network SIM and still find that there are comms outages.

Smart roaming is a standard feature of the Robustel gateways employed by KoolZone. They achieve an excellent overall estate uptime on 3G/4G connections anywhere in the world.

We have all learned a lot about the deployment of LoRaWAN solutions into commercially sensitive and time-critical monitoring applications in the cold-chain market. This means both Robustel and KoolZone are well equipped to help customers in cold-chain and other markets looking to employ this exciting new wireless technology. Working with KoolZone has been a pleasure, as there is always a desire to employ smart technology and innovate to remove any obstacles on the path to success.

David Evans, IoT Solution Architect Robustel

About Robustel

Robustel are one of the world's leading manufacturers of industrial quality solutions for the IoT and M2M market. Robustel's portfolio of award-winning solutions are comprised of: Wireless Modems, Routers, Gateways, EDGE Computing, Cloud Software and End-to-End IoT solutions.

With a state-of-the-art production facility in Guangzhou, high quality products and services make up Robustel's corporate DNA. Maintaining an ISO9001:2015 Quality Management system and a sophisticated approach to quality control, planning, assurance and improvement has seen Robustel granted with numerous global certifications, including: CE, E-Mark, FCC, PTCRB, AT&T, Verizon, Anatel, IC, Rogers, GCF, TRA, RCM, iDA, NBTC, Postel, Sirim, CCC and Telec.

Today Robustel's solutions can be found in every corner of the 'Connected World' providing IoT solutions to industries as varied as: Security, Vending, Retail, Utilities, Oil & Gas, Industrial Production & Automation, Transportation, Environmental Services and Healthcare.

To learn more about how Robustel can help your business save money and improve efficiency through IoT, please visit www.robustel.com or email info@robustel.com for more information