

CONCEPT13

Developing a Global LoRaWAN Product Solution

WHITEPAPER

A discovery into a ground-breaking three year journey for Concept13 and its client of innovation, detailing the challenges and strategic decisions that shaped this ambitious global project.

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Summary

Today, industries like smart buildings, and hygiene services are moving away from using proprietary radio frequency (RF) technology, due to its limitations in scalability, high costs, lack of interoperability, and inefficient power usage.

Instead, open standards like LoRaWAN offer a more flexible, cost-effective, and scalable solution with global compliance, enhanced security, and support for remote updates. By adopting LoRaWAN, these industries can achieve greater efficiency, long-term growth, and innovation through an interoperable and future-proof ecosystem.

This whitepaper showcases a groundbreaking three-year journey for Concept13 and their client of innovation, detailing the challenges and strategic decisions that shaped this ambitious global project. From the design of custom modules and advanced Firmware Over-the-Air (FOTA) updates to overcoming complex cellular data considerations, this initiative represents one of the most sophisticated and impactful LoRaWAN developments to date - pioneering a new standard for large-scale IoT deployments.

COMPANY AMBITION

Project Manager

"LoRaWAN emerged as a superior technology that we could leverage to enhance our existing product portfolio. Its open standards for interoperability and real-time two-way communication generating new opportunities for our clients globally".

TECHNICAL AMBITION

Technical Lead

"Switching to LoRaWAN provided cost-effective communication , allowing seamless integration. The benefits being extended range, reduced battery consumption, and two-way communication, with remote firmware upgrade support."

Challenges of a Global Deployment

Designing a market-leading product for over half a million customers, across ninety countries, in various challenging environments, was a complex task. Transitioning from proprietary Radio Frequency (RF) technology to LoRaWAN presented significant challenges, requiring custom module design to support global LoRaWAN frequencies, a network layer for Firmware Over-the-Air (FOTA) updates, and cost-efficient solutions in sensor manufacturing, gateway selection, and minimising cellular data fees.

The challenges were immense, and the strategic decisions made, as showcased in this whitepaper, provide insight into the innovative solutions implemented to achieve this successful deployment.

1

Frequency Regulation

Complying with global frequency bands and country-specific regulations on duty cycles and transmission power was needed, aligned with desire for minimal device derivatives, while retaining localised import certifications.

2

Interoperability & Standards

Ensuring interoperability through open standards to enable the scalability of the solution. Using LoRaWAN certification, to drive seamless connectivity between sensors and gateways from different manufacturers.



Challenges of a Global Deployment

(Continued)

3

Infrastructure Deployment

Ensuring scalable global coverage with certified local gateways, robust data security, and a centrally managed infrastructure with regional support.

4

Scalability Considerations

Designing a LoRaWAN ecosystem capable of supporting millions of connected devices with absolute message reliability, able to scale across new and existing markets.

5

Security Concerns

Ensuring strict, consistent security across devices and gateways despite the ongoing challenges the decentralised nature of LoRaWAN introduces.

6

Upgrade Paths

Enabling in-field Firmware Over-the-Air (FUOTA) updates to maintain existing sensors and deliver service and performance improvements over their 20-year lifespan.

7

Sensor Performance

Developing a cost-effective, battery-powered device, optimised for extensive signal coverage and multi-year battery life.

8

Data Pricing

Minimising the costs of gateway cellular data, while ensuring reliability, security, and service enhancements.



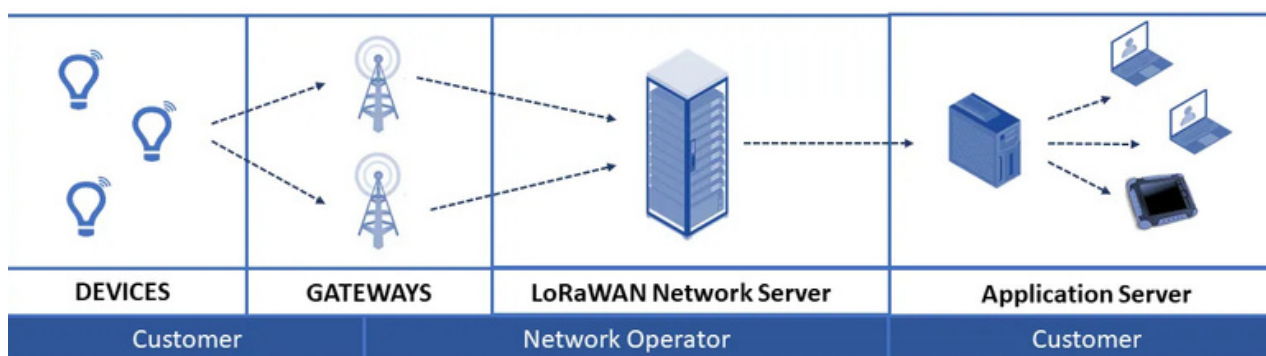
"Concept13 has been privileged to be part of this pioneering journey, which is set to become one of the world's largest global LoRaWAN deployments"

Steven Drewett - Founder & CEO



Introduction to LoRaWAN Technology

LoRaWAN is predicted to be the leading non-cellular LPWAN technology, accounting for over half of all non-cellular connections. It offers long-range communication (indoors and outdoors), license-free operation, and open standards. LoRaWAN delivers small, bi-directional regular data packets with exceptional efficiency and reliability - making it an ideal solution for IoT deployments focused on practicality and long-term performance. As an open-standards RF technology it enables low bit rate, low power, and long-range communications.



Sensors

LoRaWAN devices power IoT networks, transmitting encrypted small packets of granular data with absolute reliability. They are so efficient that they can be powered from a single AA battery lasting up to 10 years. All the devices Concept13 sell being handpicked, rigorously tested, configured and sold to facilitate dependability and performance, when put to use in your LoRaWAN project.

Gateways

LoRaWAN gateways provide outdoor or indoor coverage up to 25km line-of-sight (800m indoors), supporting up to 10,000 sensors while delivering fail-safe reliability, performance and enterprise security.



Introduction to LoRaWAN Technology

(Continued)

At Concept13, we specialise only in the MultiTech gateways, the benchmark when it comes to gateways that offer performance, durability, security and features. These Gateways critical to the overall success of your LoRaWAN estate.

LoRaWAN Network Servers (LNS)

The LoRaWAN network server is the core of LoRaWAN, enabling secure bi-directional communication, mobility, localisation, and seamless device interoperability without complex local setups.

Client Visualisation Platform

The advanced visualisation platform then delivering sensors insights to businesses to proactively manage hygiene, cleaning services and office well-being. Key features:

- **Proactive Risk Management:** Combining device insights with tenancy and climate conditions to inform, direct and mitigate health risks.
- **Real-Time Alerts:** Alerting cleaning staff or technicians to areas requiring attention, with clear activity schedules keeping clients informed.
- **Empowering Staff:** Providing frontline teams with real-time insights to improve productivity, real-time hygiene and end customer experience.
- **Data Insights:** Delivering comprehensive statistical hygiene insights for a properties compliance and in meeting KPI's.

Concept13's Role

At the inception of the project, Concept13 facilitated a one-day workshop to introduce the foundational principles of LoRaWAN. With over a decade of expertise, Concept13 continued to provide specialised consultancy as subject matter experts in LoRaWAN. Over the course of three years, Concept13 supported the development process by offering regular, independent advice and authoritative oversight in LoRaWAN.

LoRaWAN Sensor Design:

Custom Module Development by MultiTech

The transition to LoRaWAN sensors presented an opportunity to achieve significant enhancements, including extended battery life, stronger transmissions, and future-proof firmware. It also posed many challenges, including a globally certified solution and cost sensitivity while maintaining reliability. MultiTech's established track record in network connectivity made them the obvious choice. Here are the reasons why.

Approach to Design

MultiTech adopted a ground-up approach, integrating the client's input with best-practice design to develop a new market-leading, fit-for-purpose module. Available now as the xDot Essential, this cost-sensitive LoRaWAN module with market-leading performance characteristics now sits at the core of the client's solution.

Importance of Battery and Antenna Design

Achieving Energy efficiency with low power consumption characterises of just 1uA, providing up to 10 years of battery life (use-case dependent). The antenna design with validated LoRaWAN module field trials yielded excellent range, resulting in many 100's of meters in building and externally achieving multiple miles.

Advantages of Standards Based Technology

As a long-standing member of the LoRaWAN Alliance, MultiTech actively promotes and is a major contributor to the LoRaWAN standards. The globally recognised open standards approach enables customer choice and interoperability with other LoRaWAN devices. All of MultiTech's modules are fully LoRaWAN and LoRa Alliance certified.

Cost Sensitivity

As with all product developments, and outside of a solution's features, functionality, and performance requirements, the cost of the components used to achieve the desired performance levels holds a dominant and important position. MultiTech's xDot Essential & Advanced LoRaWAN modules are manufactured and assembled in-house.



Concept13's Role

Designing devices for global deployments presented unique challenges, such as local standards for message sizes, airtime and frequency. Concept13's LoRaWAN certification and compliance services, ensured continuous adherence to these global standards during the sensor design process.

LoRaWAN Gateway Selection:

Globally Certified Gateways by MultiTech

The transition from proprietary RF technology to LoRaWAN presented numerous opportunities, with opposing challenges in global certification and frequency demands. A key project goal was to source gateways from a single provider while delivering localised solutions for different countries. After extensive research, in-house testing, and commercial discussions, MultiTech was awarded the contract. Here's why;

Coverage and Range

As a leading global LPWA hardware solutions provider, MultiTech adopted a strong and consistent ethos of best-in-class LoRaWAN modules, cellular radios and electronic components. This steadfast and pragmatic approach delivers LoRaWAN capability, exceeding the client's global deployment coverage and range requirements.

Integration and Compatibility

Open Standards determines the need to collaborate with the broader eco-system of other complimentary hardware manufacture and, importantly LNS (LoRa Network Server) providers. MultiTech's commitment underpins the benefits of LoRaWAN use, enabling choice (no supplier lock-in) and confidence of product interoperability.

Reliability and Resilience

As the solution is deployed and scaled, both the provider and clients must have confidence in the reliability and resilience of data delivery and service levels being maintained. MultiTech took a hands-on approach in supporting the client with ongoing pre and post-network design advice and inclusive cloud platform for robust remote management.

Scalability

MultiTech recognises the growing importance of zero or near-zero touch installs as network deployments and hardware volumes increase. To support this, MultiTech offers pre-provisioning of gateways during manufacturing, including SIM allocation, and provides Cloud capabilities for third-party remote configuration and global distribution.



LoRaWAN Gateway Selection:

Globally Certified Gateways by MultiTech

(Continued)

Remote Management

MultiTech's Remote Management, whether Cloud-based or On-Premise, streamlines zero-touch provisioning, monitors gateway health, sets network alarms, enables remote firmware and app updates, processes event data on-site, and minimises costly truck rolls. An extensive Network Operation Centre for global gateway management.

Global Deployments

Navigating regional hardware approvals and complex local regulations is not to be underestimated. MultiTech's ability to support global deployment expansion in often dispersed geographies using the same hardware platform is enabled through its own in-house certification and approvals team who actively coordinate these activities.

Gateway Portfolio at a glance – a Gateway for any deployment scenario;

Commercial



- Designed for indoor environments
- Provide LoRa® coverage inside hotels, commercial centers, offices, retail spaces, public buildings...



Conduit® AP Access Point

- Model available with external antenna and/or PoE
- Dedicated BACnet options
- Latest Semtech Concentrator chips

Industrial



- Designed for industrial environments
- Improved coverage in warehouses, laboratories, hospitals, production facilities, factories, refineries



Conduit® & Conduit® 300 Series

- Multiple additional connectivity options for industrial applications (ethernet, serial, GPIO, etc.)
- Advanced edge computing capabilities

Outdoor



- Robust IP67 casing designed for challenging external environments
- Industrial environments, smart cities, smart regions, national roll-outs



Conduit® IP67 & Conduit® IP67 200 Series

- Easy to install
- Edge computing capabilities
- Differing price depending on budget
- Solar Powering & BB Support under development

Concept13's Role

While Gateway's have the simple role of message forwarding, the gateways must equally be secure, resilient, offer redundancy and work with absolute alignment to the LNS. Concept13 supported the exceptional detailed analysis of the Gateway connectivity, helping to resolve complex queries in message delivery and data cost optimisation.

LoRaWAN Network Server:

Enterprise Grade Global Provision by LORIoT

The LoRaWAN Network Server (LNS) is the essential central component of LoRaWAN. Only a true enterprise-grade LNS ensures the security, scalability, and reliability of global data routing throughout the network by device authentication, data decryption, and adaptive data rate optimisation. A thorough analysis of global LNS technologies was conducted. After significant analysis and live trials, LORIoT was selected. These are the reasons;

Deployment Flexibility

Modern infrastructure demands an adaptable deployment model. LORIoT's offerings ensure compliance with regional data regulations while allowing organisations to maintain sovereignty over their data infrastructure based on specific geographic and regulatory requirements.

Comprehensive Interoperability

Connected devices should work together seamlessly, regardless of manufacturer or application. LORIoT's platform supports all LoRaWAN hardware and API output formats, eliminating integration barriers in both input and output and reducing implementation complexity and migration risks.

Best Practices Security

The platform incorporates a multi-layered security approach throughout the network infrastructure validated by ISO 9001 and ISO 27001 certifications. This approach includes advanced encryption, secure key management, and comprehensive device authentication protocols. This ensures data integrity and protects against unauthorised access across the entire network.

Scalability Architecture

As the client's needs grow, the network will grow with them. Start small and expand confidently.



LoRaWAN Network Server:

Enterprise Grade Global Provision by LORIoT

(Continued)

The platform maintains consistent performance levels even as network demands increase from small pilot projects to large-scale deployments with millions of devices, ensuring sustainable long-term growth.

High Network Performance

Sophisticated network optimisation algorithms ensure maximum efficiency and reliability. The platform delivers consistent performance through intelligent resource allocation and advanced ADR implementation while optimising device battery life and maintaining robust connectivity across diverse environments.

Global Infrastructure

LORIoT's unique ability to deploy dedicated private servers worldwide and its public infrastructure of distributed servers across multiple continents provide organisations with unmatched flexibility in their IoT deployments, enabling them to maintain complete data sovereignty, ensure compliance with regional regulations, and achieve optimal network performance through low-latency connections.

Remote Device Management

Streamline operations with comprehensive remote management capabilities. From firmware updates over the air (FUOTA) to device configuration, LORIoT enables efficient management of large-scale deployments through a centralized platform, reducing operational costs and minimizing field interventions.

Customer Need-Centered Approach

The LORIoT platform is built on extensive feedback from real-world deployments across various industries. This experience translates into features that address practical challenges, supported by responsive technical expertise and a commitment to customer success.

Concept13's Role

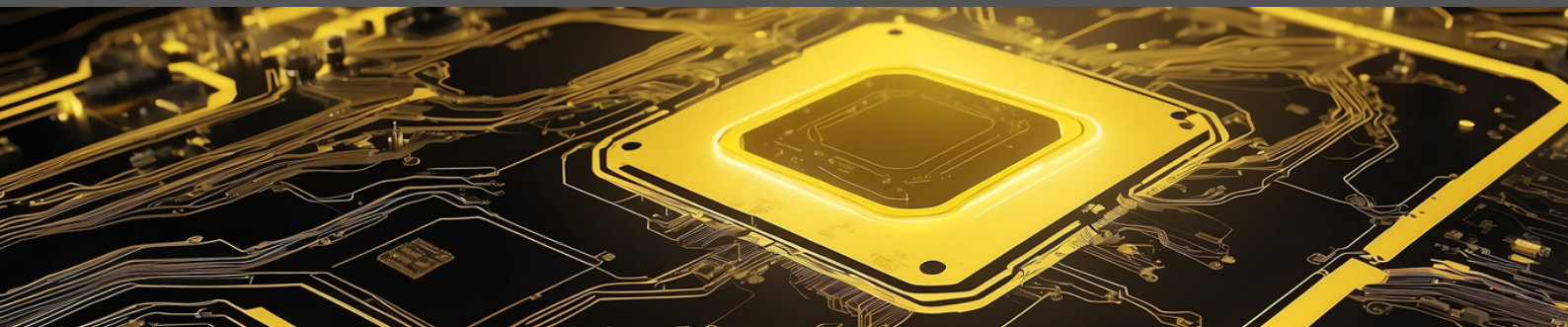
With a decade of LoRaWAN experience and extensive first hand knowledge of LORIoT, Concept13 was able to support the client in detailed analysis and field testing. By attending and supporting this trials, Concept13 provided supporting advice on device placement to ensure optimal conditions for the LNS, resulting in the most reliable outcomes with minimal battery usage.

Concept13

LoRaWAN Technology Experts

Founded in 2015, with 10 years experience, Concept13 has established itself as a trusted partner for businesses seeking to implement IoT LoRaWAN solutions that drive efficiency, cost savings, and innovation. With significant investments in research and rigorous hardware analysis, the company ensures its consultancy services and recommended products deliver reliable and impactful results, empowering clients to thrive in an ever-evolving technological landscape.

Concept13's track record in the LoRaWAN industry underscores its commitment to innovation and excellence. By fostering strategic partnerships, prioritizing research and development, and maintaining a customer-centric approach, Concept13 has become a recognized leader, delivering tailored IoT solutions to meet the unique needs of a wide-ranging client base.



Founder, Steven Drewett - celebrating 10 years LoRaWAN services and expertise, is an experienced IoT advisor and one of the first UK advisors to achieve LoRaWAN certification. Steven specialises in LoRa, LoRaWAN, and LPWAN technologies, helping businesses adopt IoT solutions, offering technical consultancy, product development, hardware sales and start-up support.



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