



The world's number one shipping container tracking company is ready to scale from hundreds of thousands to millions of units with IoTerop

Tracking shipping containers is a massive problem that requires a massive IoT solution. Leveraging existing, global cellular network infrastructure and IoTerop's IOWA LwM2M software stack, Traxens has developed a battery-powered "fix and forget" tracker that is already installed on hundreds of thousands of containers



Full Steam Ahead

Virtually every high value product travels to its end customer in a shipping container. That makes it vital to keep track of each one. Massive IoT is the answer

The Customer

Traxens was the first company in the world to track higher value shipping containers for the world's logistics companies. And it has been doing so for over ten years now.

The problem is that most of the shipping container industry still operates in the technological "Dark Ages". This means once a container is loaded onto a ship, the next time anyone knows its status is when it eventually arrives at its destination.

And that is a massive problem if, when it arrives, the \$100,000 new high-end car it was carrying has gone missing. Or the car is still there, but a port authority sniffer dog also finds several hundred kilograms of illegal drugs sitting alongside the vehicle too.

Even more concerning has been a rise in people trafficking within containers that were never designed to support human life. It is a truly horrific scenario and significant risk to the reputation of the shipping and logistics industries.

Suddenly, powerful authorities have a lot of serious questions that all start with "when?" and "where?" This means if a shipping container door can be opened anywhere and at any time, a Traxens smart tracker must be able to detect it.

In a simplified form, this is the problem that Traxens helps to solve. The value that Traxens' high value shipping container tracking solution provides is so high that a number of shipping giants have become shareholders in Traxens itself.

In fact, [ABI Research](#) estimates that low-power IoT trackers attached to returnable transport assets (RTAs) like multi-usage crates and shipping containers will reach 117 million connections by 2027. It predicts that most of these will use cellular wireless technology.

The Challenge

If coffee *helps* the world go round, shipping containers *make* the world go round. It is estimated that some 80 percent of all goods are carried by sea. This means that nearly every single high value product from smartphones and computers to cars and tractors travel to their end customers on a shipping container.

But as vital as shipping containers are to the global economy, the logistics industry is notorious for lacking visibility of containers once they are in transit. This has caused the industry to have long been plagued by many challenges, of which the two most serious are content theft from containers themselves and smuggling.

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Theft and smuggling involving shipping containers is a massive problem and one that is only getting bigger. The shipping industry has no choice when it comes to addressing the problem, and the only commercial and technologically viable way is by using modern IoT technology at a massive scale.

Lucas Moulin, Head of Products at Traxens



Some estimates suggest cargo theft totals some \$30 billion a year in the U.S. alone.

Effectively combating container content theft and smuggling starts with a deceptively simple, single capability: the ability to reliably detect whether a container door has been opened. And if it has, exactly when and where it occurred.

In the current technological Dark Age shipping industry, that detection mechanism is a manually

applied yellow seal strip that is placed onto the container door when it is closed shut. That's it. And it's not enough. If a shipping container door is opened when it shouldn't be, that needs to be a detectable and logged incident to allow a full and thorough follow-up investigation.

This needs to be independent of geographical location and environmental operating conditions, such as the container being stored within the hull of a ship, deep inside a warehouse, or during the fiercest of navigable storms.

Container shipping customers and supply chains don't want, and could not cope with, operational complexity. They just want a solution that works, and they don't care how it does it. This means that Traxens had to focus on the features of its solution and the value it provided to customers rather than the technological details of how it would manage millions of trackers. This is IoTerop's expertise via its Lightweight Machine-to-Machine (LwM2M) solutions.

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Designing a shipping container smart tracker that can operate anywhere in the world and in any operating environment it might find itself is an order of magnitude beyond designing such a device in the lab. It's about designing things to work in the real world, anywhere, all the time. And IoTerop and its IOWA LwM2M device management software stack has played a key role in helping us make that happen.

Nazim Ben Abdesselam, Head of IoT Development Team at Traxens



The Traxens Tracker

Traxens smart shipping container trackers require zero maintenance, while being able to operate self-sufficiently from anywhere on the planet

Traxens offers an end-to-end shipping container tracker solution that runs from installation of the tracker itself through to a web portal from which a customer can simultaneously monitor every tracker worldwide. Once fitted to a shipping container, a Traxens [container tracker](#) will operate for up to six years without requiring a single battery recharge.

One of biggest challenges of tracking anything at sea is that there is often no wireless connectivity at all. And given that two thirds of the planet is covered by water, this is a common operating environment for the tracker. Moreover, a shipping container can travel to any port in any country on the planet, and that means a tracking solution should be able to work reliably in every single location it may find itself.

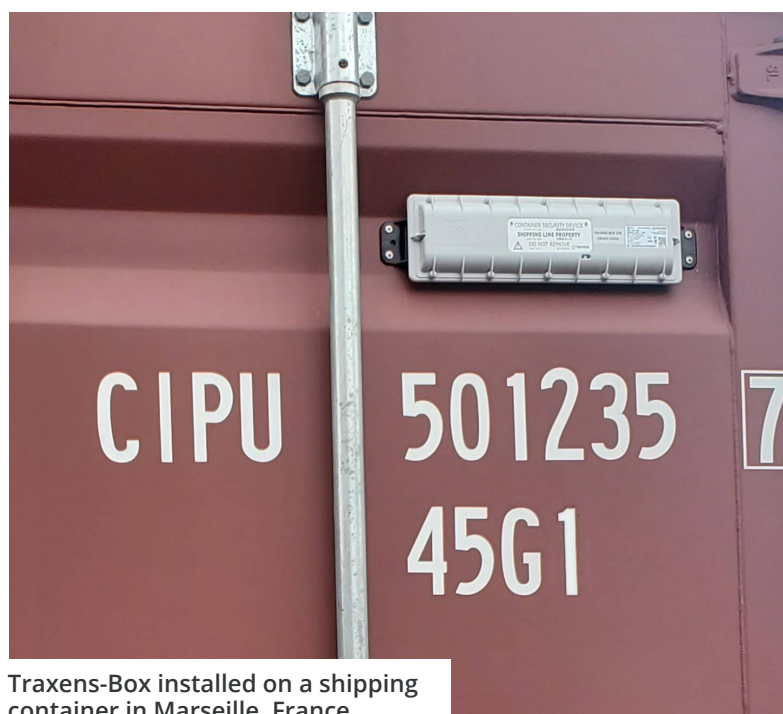
Traxens solved this problem by using IoTerop's [IOWA](#) LwM2M device management software stack, and cellular IoT wireless connectivity using existing cellular networks. It selected the latest NB-IoT version of cellular wireless technology that has been specifically designed for the low power consumption and modest data rate requirements of IoT applications, while leveraging the proven reliability and security track record of cellular. Data is stored when the tracker is outside cellular range. Once the tracker comes back into cellular range, it automatically transmits any stored data.

And if the above didn't make life hard enough, a typical shipping container is usually rented on a job-by-job basis. That means it is picked up where it ends up and rarely, if ever, returns to the same location. Once a shipping container hits a port, it will often be transferred to another freight transport company and another mode of freight transport.

This is why Traxens had to build its smart shipping container trackers to require zero maintenance, while being able to operate completely self-sufficiently from anywhere on the planet a Traxens tracker might find itself being employed.

The ability to operate anywhere includes in any environment - including the most RF unfriendly. There are so many factors that can affect the reliability of wireless communication including how containers are stacked (which can turn them into wireless signal-blocking "Faraday cages"), how they are moved, how well the tracker was installed, and whether the tracker has been damaged.

Door opening detection needs the same environmental-proof robustness in the choice of sensors. For Traxens this means completely contactless sensors, located in very carefully selected locations, and the use of AI-powered intelligence to give operational context to sensor data to distinguish "false" from "true." Even the speed at which a door is opened can throw a lesser system. This all has to be achieved without continuous monitoring which would kill the battery in a battery-powered device within a couple of days.



Traxens-Box installed on a shipping container in Marseille, France

The IoTerop Solution

IoTerop has a track record of successfully supplying LwM2M device management solutions for applications using cellular IoT

Traxens needed a simple “plug&play” smart shipping container solution that required the bare minimum of expertise to install by a maintenance person unfamiliar with wireless IoT. And even then, the tracker might have to cope with being installed incorrectly. This meant removing as much of the device-to-cloud installation, operational, and management complexity as possible.

Traxens also has the stated mission of becoming the *de facto* global leader in the high value shipping container tracking industry. Traxens has been driving digital transformation in the global supply chain for over a decade and is trusted by hundreds of global cargo owners, enabling them to reduce transport costs, optimize their operations and minimize risks.

By partnering with the world’s leading shipping lines, authorities, and insurance companies, Traxens helps members of the global logistics ecosystem reach a sustainable and optimized supply chain. This large customer base meant Traxens needed a solution that could scale from hundreds of thousands of trackers today, to tens of millions tomorrow. After doing extensive market research and meeting with multiple companies, Traxens concluded that IoTerop was the most competitive device management partner.

IoTerop had a long, proven-track record of successfully developing LwM2M solutions within the cellular IoT space in applications worldwide. Traxens saw that IoTerop’s purpose-built and fully-formed IOWA LwM2M device management software was designed for massive IoT and could natively scale from hundreds of thousands to hundreds of millions of devices. And IOWA also helps extend battery life.

IOWA and cellular IoT allowed individual shipping container trackers to connect directly to the Internet. This demanded a level of security that IoTerop’s IOWA software is engineered to guarantee over the long haul. This starts from device activation, through continuous firmware and security updates, to safe and full device decommissioning at end of life.

In parallel, operational reliability was key to Traxens satisfying customer demand. Here IoTerop’s IOWA and its underlying LwM2M device management protocol both came into their own. This included using acknowledgment receipts to make sure data stored when the tracker was out of cellular network coverage reached its intended destination before being deleted locally from the Traxens tracker.

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IoTerop’s IOWA IoT device management software did not tie us to a specific cloud provider. Although the big cloud providers share certain similarities, they all employ proprietary data models and software. These make it very hard to switch from using one platform to another. IOWA, however, completely eliminates such difficulties and allows a switch of cloud providers with minimal disruption.

Lucas Moulin, Head of Products at Traxens

The robust solution enabled Traxens customers to manage all of their smart shipping tracker devices from the cloud while being shielded from the majority of the underlying installation, management, and security complexity. As of today, Traxens estimates that compared to competing solutions or developing the device management software itself, IOWA reduces ongoing software maintenance requirements for Traxens and its customers by 70 percent and has halved its time-to-market.

Finally Traxens, and in turn its shipping customers, don’t want proprietary solutions whose vendors may not last as long as the multi-decades operating life of modern shipping containers.

Traxens-Box installed on a shipping container in Marseille, France



BUREAU VERITAS
1828

CMA CGM

Avic
Freya

TLLU 209960 3
22G1

MAX. GROSS 30.480 KGS.
67.200 LBS.

TARE 2.100 KGS.
4.630 LBS.

NET 28.380 KGS.
62.570 LBS.

CU.CAP. 33.2 CU.M.
1.172 CU.FT.

CORTEN STEEL
CONTAINER

APPROVED FOR TRANSPORT
UNDER CUSTOMS SEAL
(CSC SAFETY APPROVAL)
CSC SAFETY APPROVAL
(CSC SAFETY APPROVAL)

ONE INTERNATIONAL
MARINE CONTAINERS GROUP LTD.
C/O THE HONGKONG & SHANTON
STEEL WORKS LTD.
111, HONGKONG STREET
HONGKONG
MODEL NO. CPM-001A
TYPE: 20' HIGH CUBE DRY CONTAINER
1.11 METER WIDTH
MAXIMUM CARRYING CAPACITY
20,000 KGS. (44,000 LBS.)
MANUFACTURED BY
LIQUORICE EQUIPMENT CO. LTD.
CHINA, SHANGHAI, P.R.




CIMC

Inside IOWA

IoTerop's IOWA has given Traxens peace of mind and confidence that everything is already in place for it to scale up to ten million units plus

IoTerop's IOWA is the most efficient LwM2M device management software stack on the market. It is based on OMA's LwM2M specification. IOWA is designed to harmonize and optimize the communication and control of even the most resource-constrained IoT device or sensor, all the way up to a CMS cloud dashboard.

IOWA does this by leveraging IoTerop's state-of-the-art embedded design engineering to minimize on-air bandwidth and power consumption and squeeze every ounce of performance out of the LwM2M protocol. This technically translates into the transmission of a very small data payload. Key features of IOWA include:

-  The ability to prototype in two hours or less with an out-of-the box, validated software development kit (SDK)
-  Reduce time to market and development costs while saving internal teams hundreds of work hours
-  A transparent, flexible and affordable pricing structure that scales to massive deployment requirements

-  Get the technical help and support from a highly-specialized support team that helped build IOWA
-  Gain access to the latest LwM2M protocol, thanks to IoTerop's leadership on the OMA SpecWorks board
-  Get the smallest LwM2M software stack footprint on the market; at under 30 KB Flash and 5 KB RAM it is incredibly compact
-  Get hassle-free embedded security protecting your IoT device and its data from the start, and non-stop afterwards
-  Maximize IoT device power usage and battery life with IOWA's super-optimized LwM2M features
-  Access the latest enhanced features of the latest LwM2M version 1.2, with full backwards compatibility to versions 1.0 & 1.1
-  Effortlessly manage IoT devices over their life including commissioning, bootstrapping, security, and firmware updates

The Result

Traxens has developed a smart shipping container tracker and platform that can reliably scale—without any technological changes or loss of security and reliability—from 100,000 units today to 10 million units or more tomorrow. And what IoTerop has given Traxens is the peace of mind and confidence that everything is already in place for it to scale up to this massive IoT level.

Further, by allowing the experts in LwM2M, IoTerop, to handle the massive IoT device management through its IOWA software stack,

Traxens was able to focus on their core areas of expertise the more nuanced aspects of their high value shipping container tracking application.

In terms of technological longevity, by moving to an all standards-based, end-to-end solution, Traxens and IoTerop have developed a solution that offers decades and decades of guaranteed future-proofing.

No one expects to wake up in the next two decades to find the world's cellular wireless networks have suddenly disappeared. This means the benefits of using cellular IoT are permanent and include:



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There's a big difference between dealing with thousands and millions of devices. That's where the simplicity, scalability, security, and future-proofing of the standards-based IoTerop IOWA IoT solution comes into its own. IoTerop expertly manages IoT devices at massive scale.

Nazim Ben Abdesselam, Head of IoT Development Team at Traxens

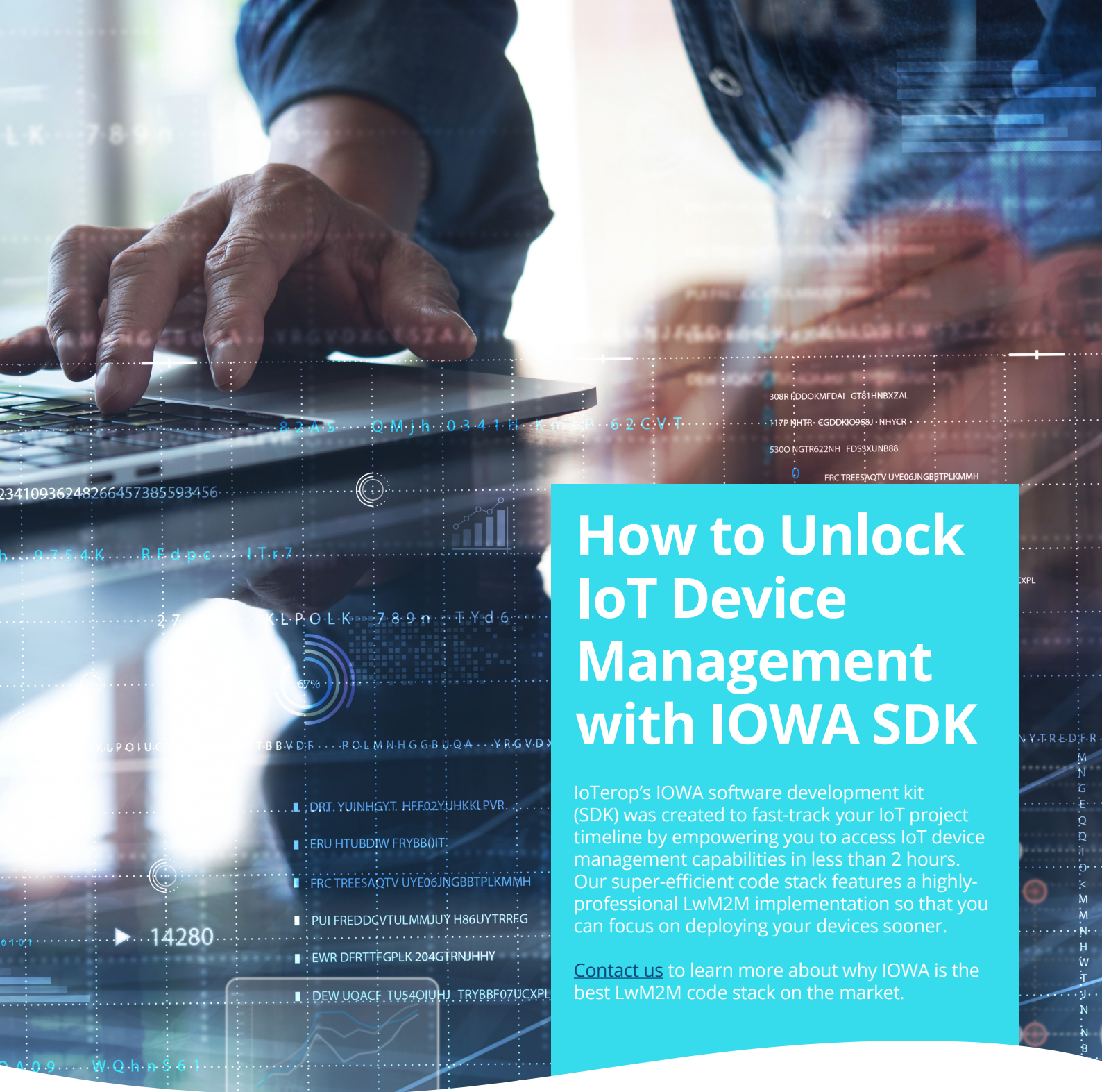
○ **Future proofing:** as a standard managed by 3GPP, a grouping of standards organizations that develops protocols for mobile telecom, cellular IoT is under constant review and development

○ **Scalability:** the roll-out of cellular IoT is largely based on established global cellular networks so it is ideally suited to support the rapid deployment of massive IoT

○ **QoS (Quality of Service):** cellular IoT is robust and reliable because it's based on a global infrastructure that's proven and mature

○ **IP interoperability:** As an IP-based technology, cellular IoT enables end-devices to be directly connected to the Internet and addressed seamlessly through cloud infrastructure without the need for expensive-to-deploy and complex gateways

○ **Affordable:** while cellular IoT does introduce data charges, competition among network operators continues to push the cost down. And increased use of edge computing reduces the volume of data that needs to be sent across the network



How to Unlock IoT Device Management with IOWA SDK

IoTerop's IOWA software development kit (SDK) was created to fast-track your IoT project timeline by empowering you to access IoT device management capabilities in less than 2 hours. Our super-efficient code stack features a highly-professional LwM2M implementation so that you can focus on deploying your devices sooner.

[Contact us](#) to learn more about why IOWA is the best LwM2M code stack on the market.

About Us

IoTerop is an award-winning software company dedicated to helping organizations build efficient smart solutions. We pride ourselves on our leadership in IoT, comprehensive support, and ability to meet our individual customer's needs.

