



# Locating Stolen Vehicles & Cargo

LoRa® APPLICATION BRIEF



Semtech's LoRa Technology Enables GPS-Free Asset Tracking Over Public or Private Networks

## DESCRIPTION

LoRa® devices and wireless RF technology (LoRa Technology) is making it easy and affordable for smart supply chain and logistics to track highly valued assets that are in transit. Large, high-value assets like shipping containers full of cargo, capital equipment and the vehicles that transport them are vulnerable to theft whenever they are in transit. Similarly, the large vehicles used by agriculture, construction, mining, and other industries present tempting targets to would-be thieves when they are left unattended in remote locations.

Fortunately, they can be secured against theft and tampering by a LoRa-enabled tracking system thus allowing the flow of goods and services to continue. LoRa Technology, combined with Cloud-based services, can unleash the power of the IoT to enable the rapid detection, tracking and recovery of stolen assets.

## BENEFITS

The infrastructure for a LoRa-based asset tracking solution consists of one or more wireless gateways distributed across a campus, city, state, or other area of interest. The gateway can be deployed as a private network or added to an existing low-power wide-area network (LPWAN) infrastructure, such as those used by cellular carriers and cable operators.

A LoRa-enabled gateway can communicate with any asset equipped with a low-power radio that supports the LoRaWAN™ protocol. When embedded within a sensor module, it enables remote monitoring of conditions such as temperature, shock, vibration, or tampering. It is also possible to determine a LoRa-equipped asset's location and direction of travel using radio triangulation.

## APPLICATION

A customizable data-driven alert system that detects an asset's deviations from its scheduled route.

## SEMTECH'S LoRa TECHNOLOGY FOR ASSET THEFT DETECTION AND RECOVERY SYSTEM

### HOW IT WORKS

Semtech's LoRa Technology enables connectivity, real-time analytics, reporting, geolocation, and route estimation.

- 1 Cargo containers, vehicles and other high-value assets are equipped with a smart, self-powered sensor module that can detect unexpected door openings, or other signs of tampering. The sensor module's embedded LoRa transceiver communicates with LoRa-based gateways using the LoRaWAN™ protocol.
- 2 The sensor module's LoRa transceiver periodically transmits its status information to all LoRa-based gateways within its range (typically 5-30 miles). The gateways forward the packets, and a precise timestamp (based on time of arrival) to a network server in the Cloud.
- 3 The control hub also keeps a close eye on the cost of the network server and sends the timestamp information to a location solver that uses a process of triangulation to generate a location fix for the asset. If in motion, its speed and direction are also calculated.
- 4 A Cloud-based application server checks the asset's status data for signs of tampering and compares its location, speed and direction against a database of authorized locations, routes and schedules.
- 5 The asset's actual coordinates are compared against its expected location or route of travel and any significant deviations are immediately flagged for further analysis. If the application server detects a potential problem, it can automatically send real-time alerts about tampering or unauthorized movements to security or law enforcement teams. These alerts include the asset's present location and anticipated route of travel, thereby enabling its swift recovery.

### REAL USE CASE SOLUTION

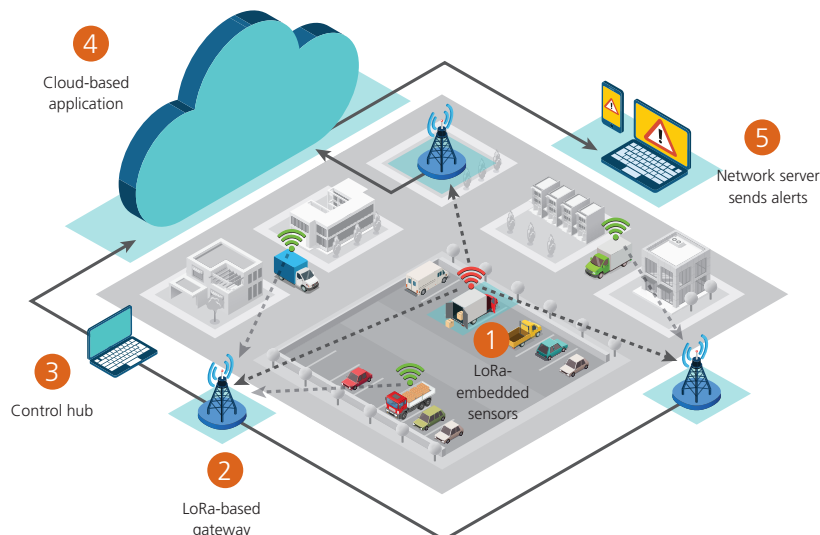
When Maxtrack, a leading vehicle tracking equipment manufacturer, needed to develop its next-generation tracking solution for recovering stolen vehicles and cargo, it evaluated several wireless technologies. In the end, MaxTrack chose LoRa Technology as the basis for its platform because it offered a unique combination of advantages that competing solutions could not match. These include:

#### GPS-FREE GEOLOCATION

The LoRaWAN protocol supports radio triangulation techniques that can track a LoRa-equipped device without the added cost or power requirements of an embedded GPS receiver. In addition, LoRa Technology operates in the sub 1GHz ISM-bands that can reach deep into buildings and other structures where GPS signals cannot.

#### LOW DEPLOYMENT COST

A LoRa-enabled application can operate over public infrastructures when they are available, eliminating the need for large capital expenditures. When Maxtrack set up one of its early vehicle tracking systems in metropolitan areas of Brazil, the availability of commercial LoRaWAN networks enabled swift deployment with greatly reduced CAPEX costs. For applications that require a dedicated infrastructure, LoRa Technology's long-range, low-power platform can connect to sensors that are as far as 30 miles away, thereby minimizing the number of gateways needed to serve an area.



Semtech Products used in this application:

- |                |          |
|----------------|----------|
| Sensors        | Gateway  |
| • SX1272/3     | • SX1301 |
| • SX1276/7/8/9 |          |

All application elements (sensing modules, gateways, servers, software) are available through LoRa Alliance™ partners.

## REAL USE CASE SOLUTION CONTINUED

### LOW PER-UNIT COST

Adding LoRa Technology to an end-node sensor module requires a single, low-cost IC, making it easy for Maxtrack to offer its products and services at highly competitive prices. LoRa-based gateways are equally affordable, with carrier-grade units, capable of covering a 15+ square miles service area, available for around \$1,500 USD.

### LOW OPERATING COST

Maxtrack and its customers enjoy minimal downtime and maintenance costs because LoRa Technology's low-power operation allows a battery-powered sensor end-node module to operate up to 10+ years between battery replacements.

### STANDARDS-BASED

Because the LoRaWAN protocol is a globally approved standard, Maxtrack can sell products that have assured global interoperability. LoRa-based products also benefit from the economies of scale that reduce unit costs and further accelerate its adoption.

### SECURE

LoRa Technology secures all communications using end-to-end AES128 encryption, making Maxtrack's systems highly resistant to cyber-attacks and data interception.

### HIGH CAPACITY

A single LoRa base station can handle millions of messages per day, ensuring Maxtrack's asset tracking solutions are able to support large, active, customer bases.

## JUMP-START YOUR IOT DEVELOPMENT TODAY

### TRAINING OPTIONS TO GET STARTED



Learn about Semtech's LoRa Technology platform  
[www.semtech.com/iot](http://www.semtech.com/iot)



Join the LoRa Community  
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Become a member of the LoRa Alliance™  
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Attend a LoRa Boot Camp for a full-day of training featuring LoRa Technology and real world applications  
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