

# Waste Management

LoRa® APPLICATION BRIEF

## DESCRIPTION

Traditionally, waste collection has been performed on a fixed schedule. However, regularly scheduled waste collection is not optimal as it does not account for different individuals or businesses filling up their waste bins at different rates. This means collection trucks must stop at each point on their route to empty each waste bin regardless of whether they are full or not. It also leads to situations where some waste bins overflow before the next collection schedule.

By implementing sensors embedded with LoRa® Technology into waste bins and using an intelligent low-power, wide area network based on the LoRaWAN™ protocol, cities can significantly reduce their operational costs by streamlining their waste collection routes and deploying trash bins only where they are necessary.

## HOW A LoRaWAN-BASED WASTE MANAGEMENT SYSTEM WORKS

Semtech LoRa Technology enables connectivity, real-time analytics, reporting, and additional functions such as geolocation.

- 1 Sensors embedded with LoRa Technology are placed on waste bins
- 2 Sensors periodically report the fill rate of the waste bins
- 3 Gateway sends information to the network where the data is analyzed by an application server
- 4 Application server creates an optimized trash route indicating which waste bins need to be emptied
- 5 The optimized route is sent to drivers via computer or mobile, so that they only empty full waste bins

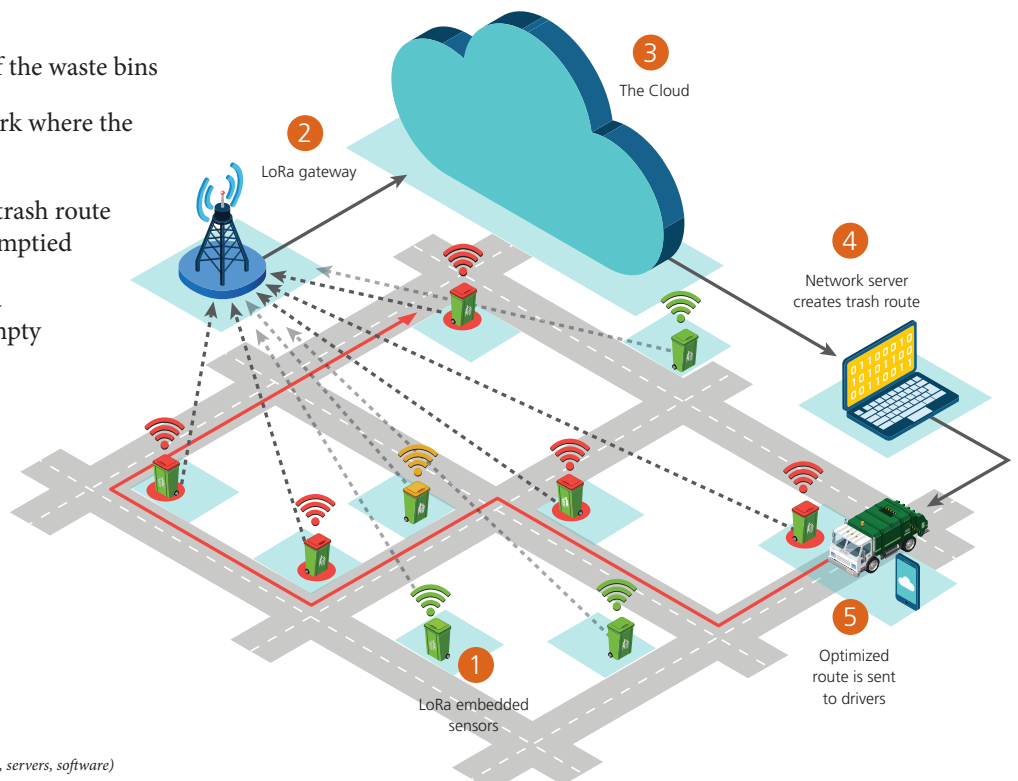
## BENEFITS

- Reduce operational costs by streamlining waste collection through the use of sensors embedded with LoRa Technology
- Keep implementation and maintenance costs low, as wireless, battery-powered sensors can be placed on existing waste bins. Batteries can last up to 20 years without replacing
- Reliable RF communication link between sensing infrastructure and LoRaWAN-based network provides excellent coverage
- Keeps cities cleaner by preventing waste bin overflow

## APPLICATIONS

Smart waste management systems help:

- Monitor trash fill level
- Schedule optimal waste collection times and routes
- Determine the number of waste bins needed



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.



## FIND YOUR IoT SOLUTION FROM SEMTECH'S LoRa ECOSYSTEM

MODULES &amp; MODEMS

SENSORS

BASE STATIONS

NETWORK SERVERS

SYSTEM INTEGRATORS








For a full list of LoRa Ecosystem partners and services, visit [www.semtech.com/IoT](http://www.semtech.com/IoT) and select a partner type to view one of the 400 companies with LoRaWAN™ compliant devices and services in the LoRa Alliance™.

## KEY FEATURES OF SEMTECH'S LoRa WIRELESS RF TECHNOLOGY

- LONG RANGE** Penetrates in dense urban and deep indoor environments, connecting to sensors 15-30 miles away in rural areas
- LOW POWER** Enables multi-year battery lifetime of up to 10 years or more
- HIGH CAPACITY** Supports millions of messages per base station
- GEOLOCATION** Enables tracking applications without GPS or additional power consumption
- STANDARDIZED** LoRaWAN ensures interoperability among applications, IoT solution providers and telecom operators
- SECURE** Embedded end-to-end AES128 encryption of data ensuring optimal privacy and protection
- LOW COST** Reduces upfront infrastructure investments, as well as operating and end-node costs

## JUMP-START YOUR IoT DEVELOPMENT TODAY

Semtech offers several training options to help you get started:

-  **Introduction to LoRa** - Free one-hour online introduction to Semtech's LoRa Technology and LPWANs
-  **LoRa Boot Camp** - Register for a full-day of training featuring LoRa Technology, real world applications and starter kit
-  For information about the LoRa Alliance™, certified products and membership, visit [www.lora-alliance.org](http://www.lora-alliance.org)
-  Join the LoRa Community: <https://semtech.force.com/lora>
-  For product information, starter kits, resource solutions, and more, visit [www.semtech.com](http://www.semtech.com) and [www.semtech.com/IoT](http://www.semtech.com/IoT)
-  Follow Semtech on [LinkedIn](#) and our [LoRa Showcase page](#)
-  To contact one of our global offices in North America, Europe and Asia, go to [www.semtech.com/contact](http://www.semtech.com/contact)

