IoT-Enabled Smart Parking Management

LoRa® APPLICATION BRIEF

Semtech's LoRa Technology Enables Optimal Management of Parking Resources Over Public or Private Networks

DESCRIPTION

LoRa® devices and wireless radio frequency technology (LoRa Technology) is making it easy and affordable to transform commercial and municipal parking spaces into remotely managed "smart lots" that can share their real-time occupancy status with other IoT-enabled applications. Until now, cities and parking lot owners had no effective way to remotely inform drivers of vacancies, or notify them that they were full. As a result, urban drivers spent an average of 20 minutes per trip in search of a parking spot and attributed to 30% of the unnecessary traffic to cities' already congested streets.

The advent of IoT can change this by enabling parking areas to report their status to operators and potential customers in real-time. By providing a robust connection between a network of vehicle occupancy sensors and a Cloud-based management system, LoRa Technology enables operators to optimize occupancy, reduce operating costs and help calm traffic congestion in urban, industrial and commercial environments.

BENEFITS

Implementing a LoRa-based smart parking solution begins with deploying a robust, high-accuracy wireless occupancy sensor in each parking space. The sensors use LoRa Technology to communicate with a wireless gateway that provides access to IoT. 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.

Once deployed in a parking space, the occupancy sensor uses the LoRaWAN™ open protocol to transmit reliable information about vehicle activity to a Cloud-based lot management application. The Cloud-based parking management system shares the occupancy information it collects with third-party applications that notify drivers of open spaces via smartphones or other wireless devices. The sensor's data may also be shared with municipal traffic monitoring systems to enable predictive congestion management.

APPLICATION

A customizable data-driven monitoring system that provides real-time occupancy status to lot operators, drivers and traffic coordination systems in smart cities.

SEMTECH'S LoRa TECHNOLOGY FOR SMART PARKING & CONGESTION MANAGEMENT SYSTEM

HOW IT WORKS

Semtech's LoRa Technology enables connectivity, real-time occupancy and activity monitoring, resource optimization, and integration with smart cities services.

1. Each parking space is equipped with a battery powered occupancy sensor that can detect the absence, arrival, presence, and departure of a vehicle. The sensors are self-provisioning, with a unique MAC address assigned to each unit that is associated with its serial number and bar code. Thanks to their low-power design, the units can run up to 10 years and require no external wiring to install.

2. When an occupancy sensor detects vehicle activity, its embedded LoRa transceiver sends a short message packet containing the change in status to any wireless Internet gateway within its range. The gateway can be part of a private LoRa network or a node in a public LoRaWAN service provider.

3. The gateway(s) forward the packets to PNI's Parking Cloud Service application that can reside either on a Cloud-based or dedicated server. This turnkey parking management solution uses the sensors' messages to keep track of open and occupied spaces. It can present parking events on a web interface, and provide parking data to third-party applications that generate billing information, and advertise available parking spaces to motorists via their smartphones or other wireless devices. It can also be customized to support a wider range of specialized services.

4. The LoRaWAN protocol support for two-way communication capabilities allows the parking manager to query the sensors.

5. The PNI's Parking Cloud service may also share real-time parking data with other smart cities services operated by a municipal or regional government. The services use information collected from several parts of a city's infrastructure to deliver unique applications, such as remote parking enforcement. Sensor-based parking monitoring works in concert with street cameras and other parking technology to eliminate "camping" in short-term parking, overstays in loading zones and other violations that keep motorists circling in search of a legitimate parking space.

REAL USE CASE SOLUTION

When PNI Sensor Corporation, a leading manufacturer of precision location and motion tracking systems, needed IoT connectivity for the PlacePod™, a high-accuracy, in-ground or surface-mounted smart parking sensor, they evaluated several wireless technologies. After a thorough analysis, PNI Sensor Corporation chose LoRa Technology as a wireless connectivity solution because it offered a combination of unique advantages.

LOW DEPLOYMENT COST

LoRa-enabled applications are self-provisioning to simplify deployment and minimize installation labor. The sensors communicate with PNI's Parking Cloud Service over public infrastructures when they are available, thereby minimizing CAPEX costs. For applications that require a dedicated infrastructure, LoRa Technology's robust, long-range, low-power technology has excellent indoor and outdoor reach that minimizes the number of gateways needed to serve an area.
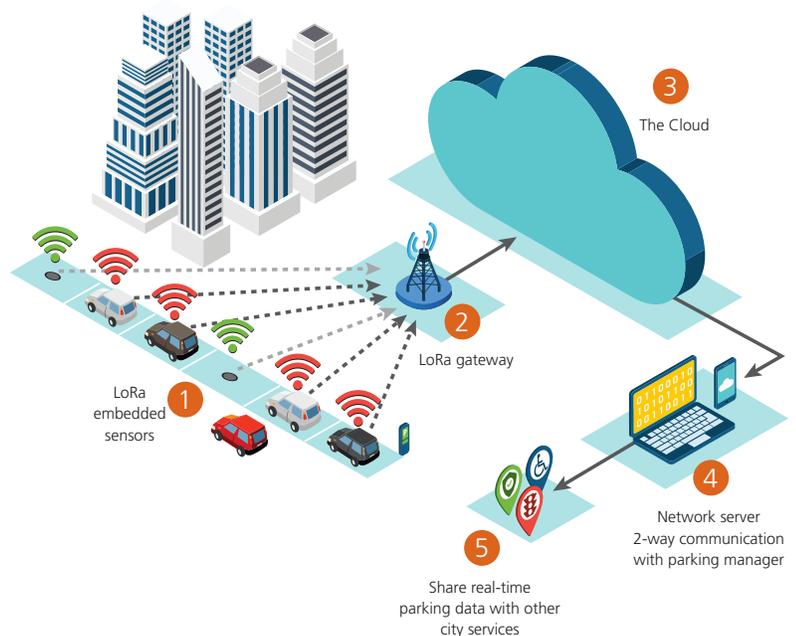
The Cloud — 3
LoRa gateway — 2
LoRa embedded sensors — 1
Network server 2-way communication with parking manager — 4
Share real-time parking data with other city services — 5

REAL USE CASE SOLUTION CONTINUED

LOW PER-UNIT COST

Adding LoRa Technology to a PlacePod sensor can be accomplished using a single low-cost IC, making it easy for PNI Sensor Corporation to offer its products and services at highly competitive prices.

LOW OPERATING COST

PNI's customers enjoy minimal downtime and maintenance costs because LoRa Technology's low-power operation coupled with PNI's high-performance geomagnetic sensor and vehicle detection algorithms, allows the PlacePod sensor to operate up to 10 years depending on configuration and distance from the gateway. Operating labor costs are further reduced because several routine sensor test and maintenance operations that are performed remotely.

2-WAY COMMUNICATION

The LoRaWAN open protocol supports two-way communication, allowing the system's Parking Cloud Service to positively acknowledge that every sensor event has been successfully received. System-to-sensor communication also enables the parking manager to initiate remote maintenance functions, such as reset and self-test.

STANDARDS-BASED

The LoRaWAN open protocol is a globally-approved standard that allows PNI to sell products that have assured global interoperability. Products based on LoRa Technology 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 PNI's systems highly resistant to cyber-attacks and data interception. The sensor's hardened communications also helps prevent PNI's sensors from becoming "soft" points of entry for hackers trying to gain access to smart city systems.

HIGH CAPACITY

A single LoRa-enabled base station can handle millions of messages per day, ensuring PNI's Smart Parking solutions are able to support even the largest metropolitan customer bases.

JUMP-START YOUR IOT DEVELOPMENT TODAY

TRAINING OPTIONS TO GET STARTED

Learn about Semtech's LoRa Technology platform
www.semtech.com/iot

Join the LoRa Community
www.semtech.com/LoRaCommunity

Become a member of the LoRa Alliance™
www.lora-alliance.org

Attend a LoRa Boot Camp for a full-day of training featuring LoRa Technology and real world applications
www.semtech.com/iot

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