

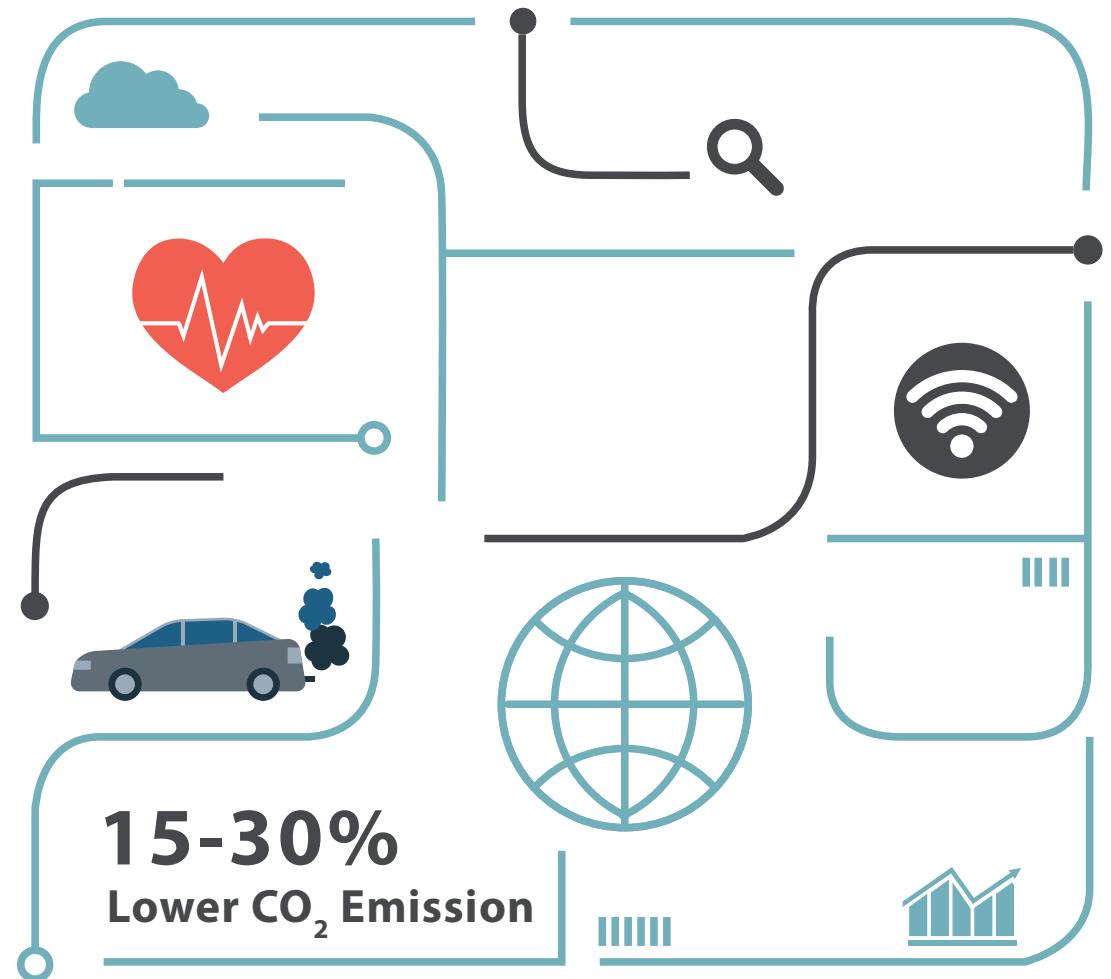


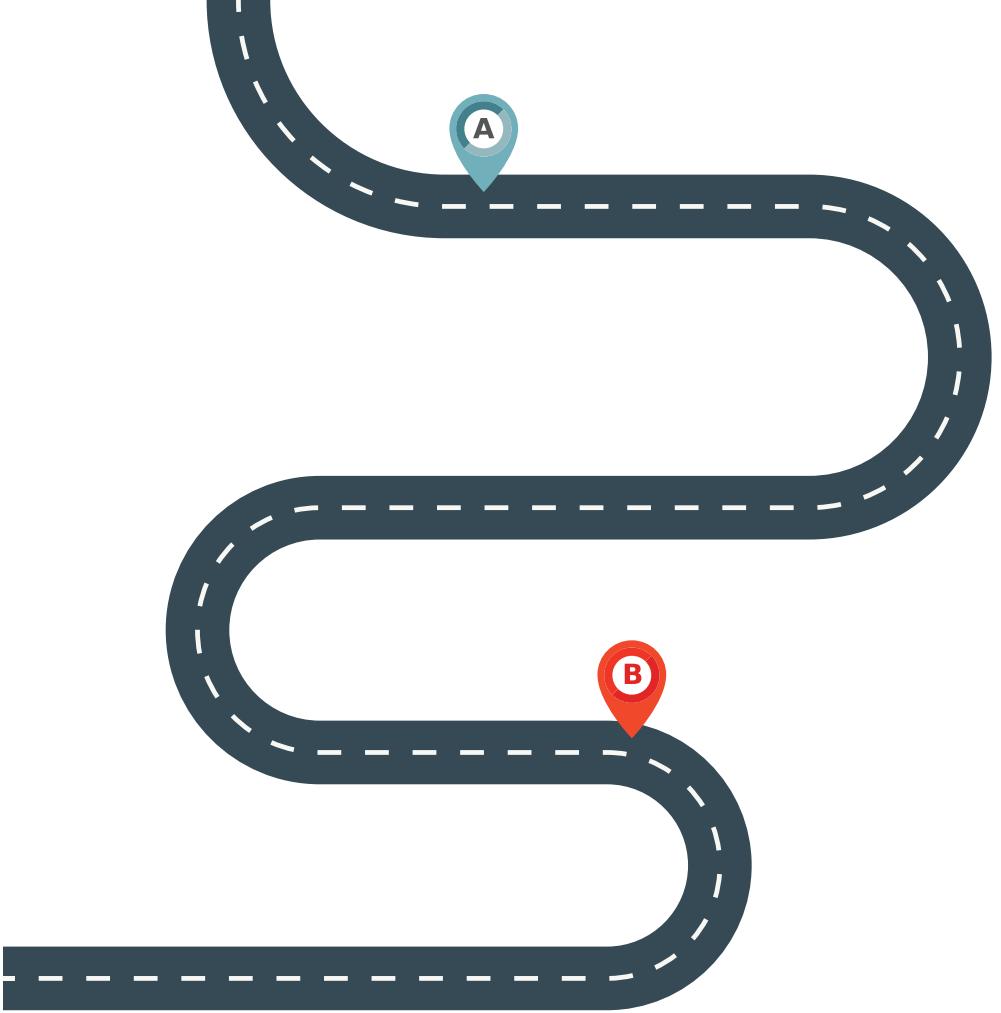
Smart Parking IoT Solution

QUICK REPORT

Key benefits and most demanded features from the
Smart Cities Market

The Internet of Things
is enabling the
detection of
free parking spots to
reduce gas emissions
and traffic congestion
while increases
drivers' health.





Driving around looking for an available car spot:

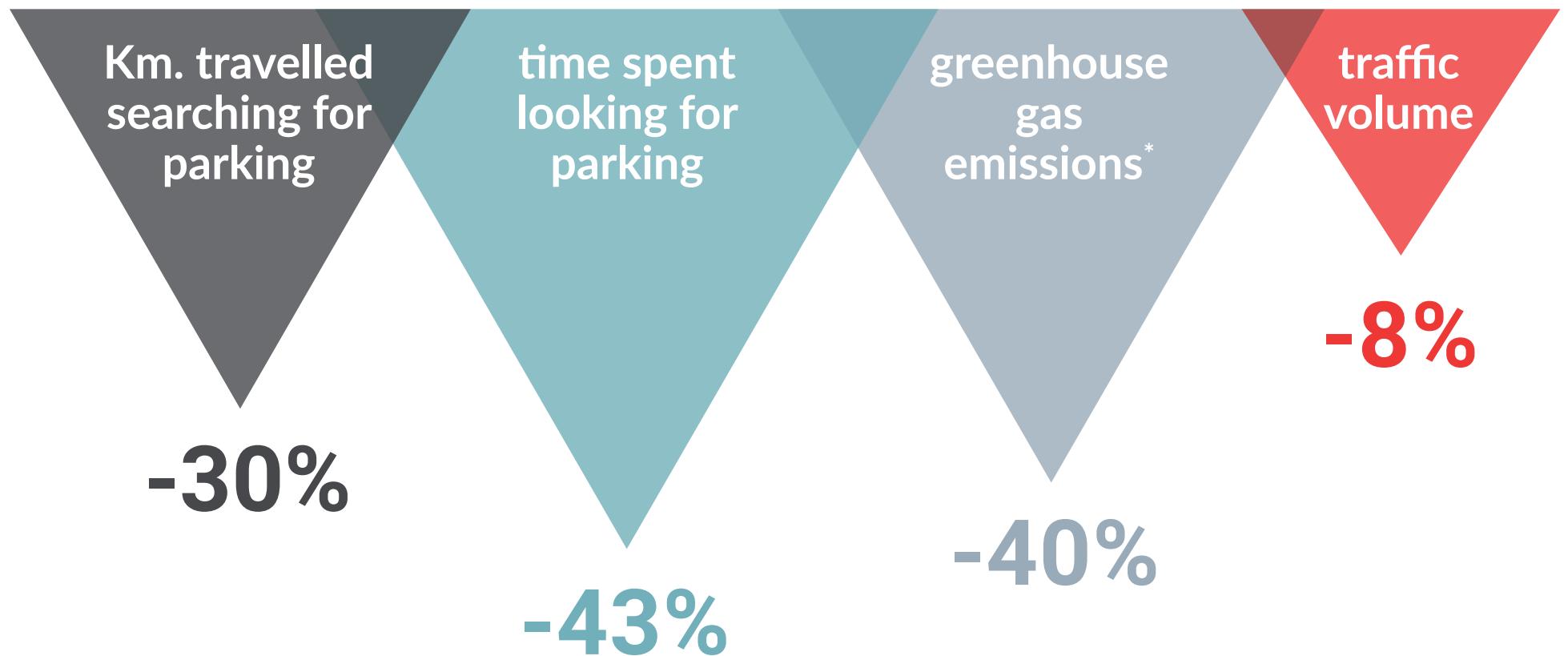
- Wastes fuel
- Produces anxiety
- Increases pollution in city centers.

LOOKING FOR A PARKING SPOT



Ten minutes **searching for car parking** several times daily means more than 240 hours per year, and an average of 700 complete days **in your life**.

Smart Parking solution can reduce



by 2050

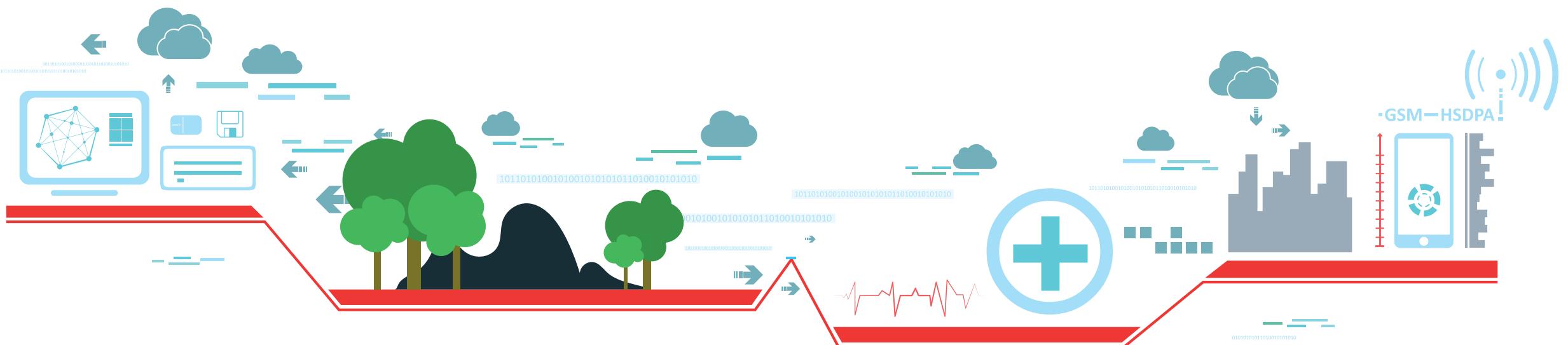
66%

world's population that
lives in urban areas

Public authorities are worried
about the **impact** that the increase
of people could have in the urban
planning of metropolises.



Real-time data and analytics improves city planning, urban mobility and allocation of resources





PARKING SLOTS

- Optimization of capacity
- Special permits
- Online payments
- Loading /unloading areas
- Taxis / public transport
- Disabled
- Parking guided systems



ROADS

- Congestion
- CO₂
- Noise

DIRECT BENEFITS OF A SMART PARKING SOLUTION



PUBLIC AREAS

- Emergencies /availability
- Revenues
- Special permits detection
 - Disabled parking places
 - Electric vehicle recharging places



MALLS

- Pricing strategies
- Time spents looking for a parking space

ADDITIONAL PARKING REVENUES FOR A CITY COUNCIL

- Having real-time information about parking spots increases parking revenues by up to 35%
- Enforcement cost reduction and reduced parking violations
- Reduction of noise pollution
- Improvement of quality of life and the reputation of being a greener city
- Technological advancements such as online payments and development of mobile apps for reserving parking slots are instrumental in driving the implementation of smart parking systems



WHERE TO INSTALL SMART PARKING SENSOR NODES



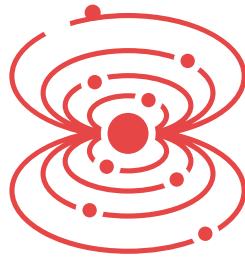
There are large number of vehicles that need to be positioned appropriately to avoid congestion. In such situations, a **Parking Guided System** provides directions and accuracy in terms of parking the vehicles to the drivers

Smart Parking Sensor Node

Strengths



Smart Parking Sensor Node



Radar detection system

| | Radar | Magnetometer | Infrared |
|---|-------|--------------|----------|
| Immunity from vehicles adjacent to empty space | ✓ | ✗ | ✓ |
| Robust RF performance | ✓ | ✗ | ✗ |
| Ignores nearby double parked vehicles | ✓ | ✗ | ✓ |
| Accommodates dirt, dust or oil on sensor | ✓ | ✓ | ✗ |
| Not vulnerable to electromagnetic interference | ✓ | ✗ | ✓ |
| Consistent performance in all lighting conditions | ✓ | ✓ | ✗ |
| Reliable state during long-duration stays | ✓ | ✗ | ✓ |
| Unaffected by nearby slow moving traffic | ✓ | ✗ | ✓ |

- Greater precision, improved detection and stability performance:
99% accuracy

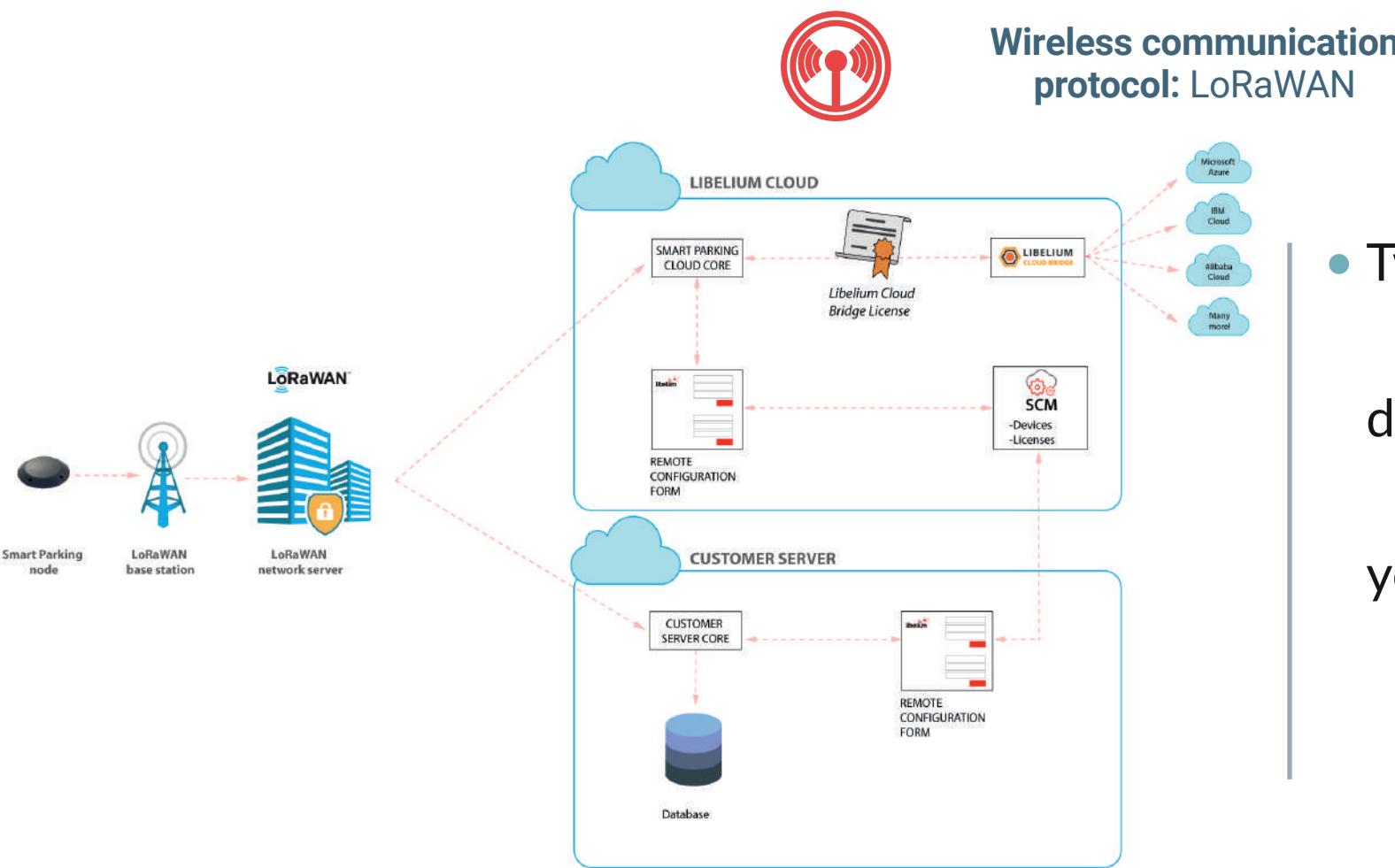
Smart Parking Sensor Node



**Wireless communication
protocol: LoRaWAN**

- Available for Europe, US, Latam, Australia and Asia Pacific
- Nodes provisioning in the LoRaWAN network server at any one time including default time settings and unique LoRaWAN identifiers and keys.
 - Configuration via Smart Devices App (Java desktop application).

Smart Parking Sensor Node



- Two possible scenarios:
 - Libelium Cloud Server to forward data to third party cloud platforms
 - Customer Server to parse data in your own server

Smart Parking Sensor Node



Triple installation option:
on surface / semi underground
and underground

- **3 types of installation:**
 - On the **surface** (fast and easy)
 - **Semi-underground:** for special situations
 - **Under the ground** (convenient for cities where snowplows operate in winter or to avoid theft)
- Nodes can be installed when already programmed

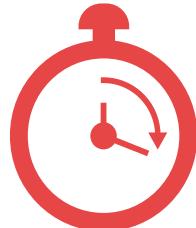
Smart Parking Sensor Node



Triple installation option:
on surface / semi underground
and underground

| | On-surface | Semi-underground | Underground |
|------------------------------------|----------------------|------------------------------------|--------------------------------------|
| Type of enclosure | Vaulted | Vaulted | Flat |
| Presence of node over the ground | Full node (40.25 mm) | Part of node (~6 mm) | Node completely (0 cm) |
| Rain immunity | ✓ | ✓ | Partial |
| Puddle immunity | ✓ | ✓ | Detection may fail if puddle appears |
| Vandalism/robbery immunity | Medium | High | High |
| Snowplow immunity | No | Possible | ✓ |
| Installation process | Fast and easy | Special tools needed | Special tools needed |
| Tools needed | Normal drill | Industrial, big crown drill. Epoxy | Industrial, big crown drill. Epoxy |
| Can be dismantled for maintenance? | ✓ | ✗ | ✗ |

Smart Parking Sensor Node



1-minute configuration

- Pre-programmed from the factory: **1-minute configuration, no programming**
 - Over-the-air set up via “remote configuration form”
- To easily update settings of each node such as sleep time, keep-alive time, night-mode...
- Remotely update via LoRaWAN downlink radio packets

Smart Parking Sensor Node



Waterproof IP68 enclosure

- Robust waterproof **IP68 enclosure**
- Easily reset by passing the magnet over the node
 - Wider range of **temperature: -20°C to 65°C**
 - Resistant to tampering and vandalism

Smart Parking Sensor Node



Long lifetime - low power

- The battery has a **huge capacity** of 10,400 mA·h
 - Expected **life time up to 10 years:**
 - *low-power*
 - *high-capacity battery*
 - *night mode*



Please contact sales@libelium.com for more information about Libelium Smart Parking