LPWAN for mass IoT Connectivity

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SIGFOX AT A GLANCE
Tech company backed by Industry, Finance and Telecom leaders

Founded in 2009, Sigfox is a French company that provides a connectivity and cloud solution dedicated to low throughput/low energy devices

Sigfox has become the world’s leading provider of a global communication solution empowering the Internet of Things

HQ in Toulouse and several offices in Paris, Madrid, Boston, San Francisco, Singapore, Dubai

350 employees
IoT connects things to the Internet to make them come alive

There is no one-fits-all connectivity solution for all IoT use cases

ITU Definition

“a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies”
**What is the ecosystem behind the IoT**

<table>
<thead>
<tr>
<th>1</th>
<th>Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical things that embed various technologies of sensors, intelligence and connectivity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport data from objects</td>
<td></td>
</tr>
<tr>
<td>Many connectivity solutions could be used depending on the use case addressed: mobile networks (2G to 5G), satellite, low power access (e.g. Sigfox, WiFi, Bluetooth, etc.), ...</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Data processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computing (more or less distributed) providing tools for storing, correlating and analyzing the data</td>
<td></td>
</tr>
<tr>
<td>It may include decision-making processes enabling commands of physical things</td>
<td></td>
</tr>
</tbody>
</table>

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**IoT development needs multiple stakeholders & new business models**

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I need fertilizer!

Parasite!

I need water!

Time to harvest!

Hot and Windy today!
I need water!

Rats!

Toilet needs to be cleaned!

Hot day! Turn up the aircon!

Light is on!

People coming in!

Taxi!

I need maintenance!
Air quality is fine!
Hot!
Water leak!
Billboard broke!
Water level high!
Garbage full!
Carpark available!
Structure is fine!
Change my LED!
Why IoT has not taken off yet?

**ENERGY EFFICIENCY**
- GPS coordinates: 6 bytes
- Temperature: 2 bytes
- Speed reporting: 1 byte
- Object status: 1 byte
- «Keep alive» payload: 0 byte

**NATIONAL/GLOBAL REACH**

**COST EFFECTIVENESS**

**SIMPLICITY**
The solution

Instead of trying with traditional networks, why not be part of a global network for everyday objects?
Key Goals for mass IoT enabled by LPWAN

- Ultra Low Cost (Devices & Connectivity) to address everything
- Ultra High Capacity – Scalability
- Ultra Low Current Drain to provide autonomy
- Simplicity

Existing Technologies are not optimal for things that have simple and mobile or long range connectivity needs and that are battery powered.

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Low Power Wide Area (LPWA)

- LPWA consists of end-devices and a network (access station + core network)
  - End-devices are scattered in the field (outdoor or indoor) and communicate with the network over bidirectional radio links (primarily uplink)
  - Network made of base stations and service centre, which connects the LPWA system to the application servers
- LPWA system is a star with the service center as its hub
- Compared to other non-specific SRD, a LPWA system is massively asymmetrical. i.e. it connects tens to hundreds of thousands of end-devices to one base station
- LPWA, unlike LTE, is available to non-mobile network operators because it can operate over unlicensed spectrum

Source: ETSI TR 103 435
LPWAN Base Station vs Traditional Mobile Base Station

**Uplink**
- Uplink communication is the primary communication
- Half Duplex or Simplex
- End-devices will not transmit continuously typically
  - Radio transmitter inactive (turned off) when no data to be sent
  - Radio transmitter is normally active for few seconds per day
  - Radio transmitter only transmit a few messages per day
- Low spectrum occupancy

**Downlink**
- Downlink communication is optional or when required

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Low Power Wide Area Network
complementing existing networks to address the bulk of connected objects
Complementing existing technologies

- Energy Efficiency for GSM/LTE Cellular Devices
- Anti-Jamming
- Provisioning of BT/WIFI Code
- Uplink of Satellite Set-Top Box
- Back-up Connectivity
- Online Diagnostics for DSL Boxes
- Geolocation using WiFi
- Cellular
- Others
- Short Range
- LPWAN

Confidential 14
Overview LPWAN Value Chain

LPWAN network

- Chip / module provider
- Base stations provider
- Network software provider

End to end LPWAN service

- Chip / module provider
- IoT device provider
- Network operator
- App enablement platform provider
- IoT service provider
- End user

Unlicensed spectrum harmonisation for LPWA? accelerate mass IOT adoption

SIGFOX LPWAN for unlicensed spectrum (919 – 923 MHz)

<table>
<thead>
<tr>
<th>APAC</th>
<th>Device</th>
<th>Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro bandwidth</td>
<td>192 kHz</td>
<td>192 kHz</td>
</tr>
<tr>
<td>Target centre frequency</td>
<td>920-925 MHz</td>
<td></td>
</tr>
<tr>
<td>Max transmit power</td>
<td>150 mW ERP</td>
<td>1000 mW ERP</td>
</tr>
</tbody>
</table>

Australia, New Zealand, Singapore, Malaysia, Hong Kong, Thailand, Taiwan, Cambodia, Myanmar Columbia, Argentina, Mexico


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Open ecosystems for LPWAN chipset & Modules
Sigfox Verified
300+ LPWAN Devices in the Ecosystem & Growing…

Agriculture
- Monitor animal’s condition and location

Automotive & fleet management
- PV tracker

Health & Assisted Living
- Co-assist
  - Detects falls, inactivity, geofencing

Utilities
- Kamstrup
  - Water metering

Industry
- Emergency stop trigger

Smart cities
- Smart lighting

Building management
- Safety camera

Smart home
- Sound detector

Retail & services
- Very low cost button

Industry - building
- Structure monitoring

Personal
- Stolen vehicle recovery

Public Sector
- Sewage monitoring

Smart home
- Connected boiler

Industry - airline
- Reactive maintenance

Industry - shop
- Customer satisfaction

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Key Use Cases
Smart Button

Challenge
Make the best and simplest possible interface for people to be willing to press on the button.

Solution
A physical button to be used for a call to action targeting:

- Services (taxi ride on demand for hotels and restaurants, quick call to maintenance services)
- Assistance / maintenance requests
- Process management to notify completion of a task
- Restocking

Benefits
- Addresses multiple sectors
- Simple interface
- Cloud based service / no app to install
- Branding and marketing thanks to customization
- OpEx-only business models from 1€ per month
HEALTH & ASSISTED LIVING

Key Use Cases
Assisted Living Box

Challenge
The city council of Loiret in France, which supports financially medical cares for seniors, was regularly overcharged by care service providers. With the ageing population, there is a need for solutions to help seniors staying at home longer without their relatives worrying too much.

Solution
The Lysbox helps monitoring service providers and automate the billing based on the actual time spent with the seniors. It also sends alerts to neighbors or families in case of a heat wave or cold spell detected through the temperature sensor of the device. Finally, seniors can also call for help thanks to the emergency button on the device.

Benefits
- The ROI was reached within the first 6 months thanks to the savings of 3 million € per year, which represent 10% of their budget. The total cost of the project was 1.5 million €.
- The adoption rate was 97% among the seniors.
- The social isolation broke down and services quality went up.
Connected Defibrillators

Challenge
Defibrillators are often located in remote areas where it is hard to regularly perform auto tests of equipment to ensure they are functioning correctly. Customers who own several defibrillators (e.g. industry) want central supervision. Previously connected boxes were expensive (GSM) and needed to be wired.

Solution
A wall mounted box compatible with Philips HS1 defibrillator, sending monitoring information:
- Door status (open / close)
- Defibrillator’s status (OK / NOK)
- Daily Auto test & Battery test

Benefits
- Working defibrillator guaranteed
- Easy installation
- Added value services: notifications, central supervision
- Fully wireless: no mains power
- Low power: 4 year autonomy (LR)
- Plug & Play customer installation

Alternative partners for this application
PUBLIC SECTOR

Key Use Cases
Waste Management

Challenge
Optimize the cost of waste collection in public places.

Solution
The ultrasonic sensor indicates the level of waste inside a dumpster and confirms when the waste has been collected.
The platform helps optimizing the collection routes, resulting in savings up to 50% of collection operating costs.
It can also generate an alarm signal in case of fire or when the container dumped.

Benefits
- Battery life superior to 5 years with 2 AA batteries for a sampling period of 15 minutes
- Remote configuration
- Plug and play
- Reduce up to 50% waste collection operating cost
Smart Parking

Challenge
Make the management of parking spaces more efficient.

Solution
WITTY is the intelligent parking management solution that provides relevant information to communities to help them managing urban spaces.
The system doesn’t need of any infrastructure deployment or maintenance effort during its lifetime (no repeater or access point).
The sensor is completely buried causing no problem to maintenance operators or snow removal.

Benefits
- Orientation towards the free areas by a dynamic parking guidance
- Real time geolocation of the parking offenses
- Optimization of local police enforcement
- Fast parking slots control
- “Long time parked” vehicles identification

Alternative partners for this application
UTILITIES

Key Use Cases
Water Metering

Challenge
Expanding the customer base faster while reducing the operation costs.
Local authorities wanted to promote a more sustainable use of water resources by users

Solution
Automatic remote water-meter reading and automated billing based on actual consumption
Alarm in case of outage and pipeline failure
Real time network monitoring and infrastructure management optimization

Benefits
- Productivity gain (leak detection)
- New end-user services
- Compliant with Warsmann law on overconsumption alerts
- Improved invoicing & investments
- Reduced frequency of maintenance thanks to remote monitoring and long battery life
Smart Building Management

Challenge
Help businesses and local authorities to better use energy in an environmentally-friendly way.
Offer all types follow up services, management and smart metering to optimize their energy performance.

Solution
Four types of device (temperature and humidity sensors, smart meters and dirty filters detectors) all using SIGFOX Ready modules

Benefits
- Increased energy efficiency through data analysis
- Increased reactivity to leak detection limits water loss
- 4 additional products in their product catalogue

“Gains in terms of installation and implementation are indeed significant, allowing us to offer our services to new buildings, such as multi-site”
INDUSTRY

Key Use Cases
Pallet tracking for logistics

Challenge
Losing 10 to 15% of pallets each year.
How to recover part of the lost pallets balancing cost of the solution & Power saving

Solution
Track and trace a fleet of pallets
- GPS-FREE location services
  - combine data analytics & machine learning
- low cost and ruggedized device
Overall low TCO from devices to connectivity going thru GPS-Free location services

Benefits
- Saving costs
- Affordable solution for extremely cheap asset (sub $5 tracking device)
- Avoid expensive and power consuming GPS-based solution
- Offer additional services to customers
HOME & LIFESTYLE

Key Use Cases
Home Alarm System

Challenge
Alarms are traditionally connected through GSM to central system and burglar intrusion can be facilitated by GSM jammers. There is a need for effective backup connectivity to ensure more robust alarm transmissions.

Solution
Sigfox has upgraded customer's alarm systems to provide a back-up connectivity in case jamming is detected.

The upgrade was possible over the air as a Sub-GHz chip was already inside.

Benefits
- Robustness of solution is a commercial differentiator
- Continuity of service
- Soft deployment via over the air update - no HW swap. No user impact
- Network available to handle millions of devices
Sports GPS Tracker

Challenge
Make a low cost GPS tracker targeting hiking and extreme sports fans.

Solution
Real-time GPS tracker allowing the user to share its position with others.
Battery enabling up to 1 month of continuous tracking (vs. 2 hours for a smartphone) with a position every 3 minutes.
- Waterproof
- Emergency button
- Micro-USB charger
- Phone application, online Map & API

Benefits
- No need of a phone
- Waterproof
- Long reach (mountain areas)
- Small form factor
- Storage capability when the device is out of range
AGRICULTURE & ENVIRONMENT

Key Use Cases
Crop Management

Challenge
Farmers are wasting or not using enough resources (water, pesticides, …)

Solution
Connected sensors that collect meteorological and field data so that farmers perform the right actions at the right time and use the appropriate amount of resources.

Benefits
- Easy to use
- Autonomous
- Real-time: tens of daily measurements accessible 24/7
- Robust & water-proof devices to resist to outdoor conditions
- Optimize farmer’s time
- Save resources
Livestock Management

Challenge

Improve efficiency and safety in farming

Solution

Location system for livestock farms. It offers location, monitoring and traceability capabilities, detecting anomalies due to temperature, activity, behavior and calving. Increases farm profitability by detecting in calving periods; by reducing production costs through a losses cut-off and by improving animals’ welfare through constant monitoring.

It sends alerts (animal outside the farm, abnormal activity, weather alerts, etc.) to the farmers.

Benefits

- Affordable
- Long battery life
- Gives a real-time visibility on the livestock location
- Reduces the number of diseases by accidents, calving, thefts or attacks by other animals
- Cut-off operating costs
The future?

Our Imagination is the Limit!