

IOT APPLICATIONS FOR SMART CITIES WHITEPAPER

Sensors, Gateways
and Cloud are making
cities smarter and
greener, improving
citizen participation
whilst reducing costs.
Read on to see how.



The IoT Revolution

The World is seeing the dawn of a new industrial revolution, arriving on the wings of wireless communications and fostered by the rise of connected objects. Today, it is widely known as the “Internet of Things” (IoT).

The concept of Smart Cities has caught the imagination of policy makers, governments and the industry like never before. The world of sensors, gateways and cloud applications is transforming the entire landscape of management and control at the disposal of an organisation that has assets in remote offices and dispersed areas. Many industries and countries have already benefitted tremendously from IoT applications.



Large cities have thousands of public buildings, each with its own energy patterns, air quality issues and sensor devices. It can be challenging for managers to identify those which are operating efficiently, and those that are not. An IoT platform is required that is flexible and easy to use, generating alerts when something is not right. It needs to provide user-friendly apps such that building managers can take actions in real-time to optimize resource consumption and keep building occupants safe and comfortable. It must be able to connect to any internet connected device, collect data and manage the device.

Enablers of the New Capability

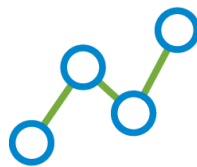
Sensors and Analytics are at the heart of the IoT revolution. The proliferation of Sensors is driven by the creativity and innovation in the area as also the rate at which the cost of sensors has declined and is forecast to continue.

Sensors are assisted by Gateways, which are responsible for capturing the sensor data and transmit it to the Internet based application.

The significant enhancement in bandwidth and coverage of mobile networks, together with declining costs per MB, are making it possible to haul massive amounts of data over huge distances. The

GSMA e-SIM is making possible an always-on connection, providing mission critical connectivity by the use of industrial grade SIMs that are able to automatically select the best available network.

The availability of inexpensive and on demand computing power, together with disruptions in real time machine learning and analytics are the engines for creating actionable insights from the “trillions of bytes” generated by the billions of connected objects. These nerve centres can analyse incoming data from Sensors located thousands of miles away to provide real time monitoring, control and action.



Impact Areas

The IoT capability provides the industry and governments tremendous opportunities for improving the environment whilst enhancing value in these areas

1. Energy Management
2. Environment Control
3. Remote Monitoring
4. Machine Control
5. Service Uptime
6. User Comfort

Solution Overview

Sensorise has integrated frugal yet powerful technology components to ready a selection of Sensors, Gateway, IoT platforms and Web and Mobile Apps that enable the deployment of connected services quickly and cheaply. It gives utilities and municipal authorities real-time visualization of resources used by public buildings: energy & water consumption, distributed renewables production and indoor air quality. The platform bridges disparate building management systems with a common database.

A powerful orchestration engine offers information and control to different processing components, services and building devices. Forecasting, decision support and remote control features (i.e. Demand Response) allow optimal resource planning on the fly. All the processing components and

services are integrated on an industry-standard service bus. It is specially designed as a replicable and modular tool that takes into account the heterogeneity of resource management systems across city buildings. The platform includes robust data encryption layers, as well as a standardized API for third party tools integration. The Cloud

application implements a GUI based configurable Business Rules engine, that makes it possible for the business to implement real time and automated control actions, whilst also providing real time alerts and notifications to the Strategy, Operations and Service Teams,

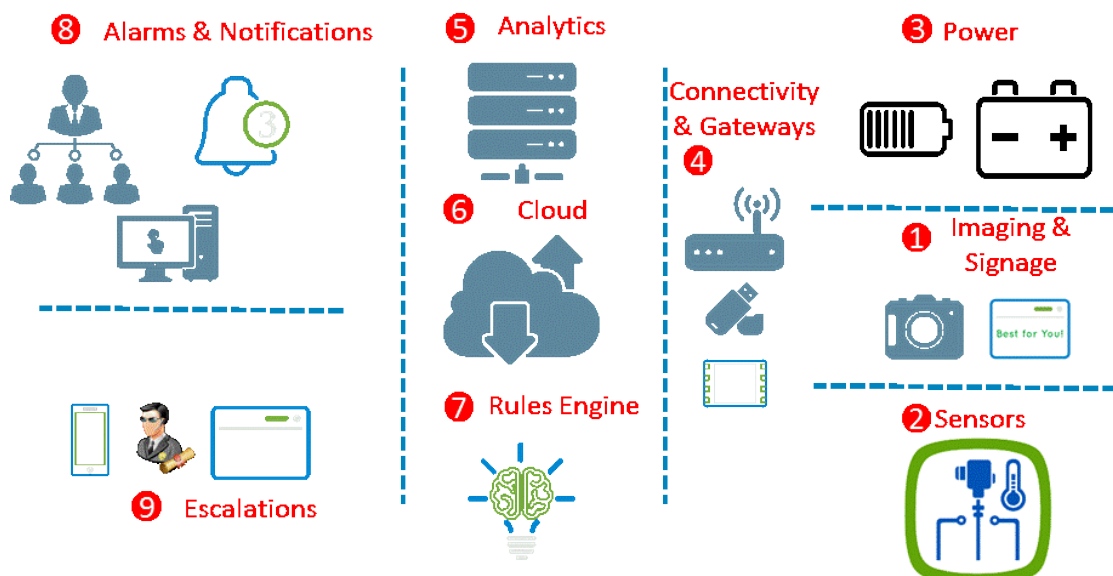


Figure 1: Sensorise IoT Solution



Energy Management Functions

The solution has the following specialised functions

1. A Smart City database, capable of providing secure and real time access to data from varied infrastructure from different end points in a city
2. Data Models to forecast short-term energy consumptions and productions based on Artificial Intelligence technologies
3. A de-centralized energy decision support system for a central control. A new approach to data analysis and aggregation with a two level decision support: a) for Energy Companies and authorized third parties, and b) for citizens.
4. Generic advises in Demand Response with alarms and notifications to any type of mobile device, and tools that can perform almost direct demand control of a large amount of heterogeneous energy consuming devices
5. An energy simulation framework that supports “virtual units” (such as batteries, EV charging stations and other distributed resources) inside the decision support system to analyse and understand the effect of the current energy situation of the city in terms of consumption, production, CO2 emissions, etc.
6. A virtual ‘energy market network’ that supports different

energy exchange models at city level

7. A business model framework created on the concept of dynamic network of actors such as energy providers, service providers, information providers, etc. that supports contractual demand control schemes, dynamic multi-tariffs, opportunities for load shifting, load shedding, storage utilization, prioritization of renewable energy, etc.
8. Business Analysis tools that demonstrate to the energy provider the economic attractiveness of Smart Energy Management Systems and the IoT infrastructure in terms of shifting and optimizing load on the grid, aligning the demand with needs and prices, maximizing the use of renewable energy sources, and balance electricity load without adversely affecting grid stability.
9. Tools to allow consumers to actively engage in the ‘energy market’ with inputs of their supply and demand at the personal as well as at the community level
10. Analytics that facilitate “virtual” energy exchange between consumers and producers in the community enabling the construction and efficiency of renewable energy sources in the community
11. Define a methodology for (I) citizen empowerment (II) municipality engagement (III) energy companies and (IV) construction parties in participative decision-making

Sharad Arora, Managing Director, Sensorise Digital Services Private Limited, sharad.arora@sensorise.net
Pedro Espinel, Director of Global Sales, Sensing & Control Systems S.L., pedro.espinel@sensingcontrol.com

Sensorise is a provider of end to end lifecycle management solutions in the domain of e-SIM and IoT
www.sensorise.net

