Solutions Brief

# NuvlaCity

## Enabling Smart Cities with Edge and Cloud

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# 1  Introduction

**NuvlaCity** is the name of the IT solution developed by SixSq which enables the optimal deployment of new edge and cloud technology to support IoT-based services in smart cities.  Now that cities are entering the digital era, NuvlaCity supports them in their transformation process.

# 2  The Challenge

As cities turn to the latest technologies to make their services smart, they are faced with an astonishing array of choices. Smart cities rely on data which has to be collected, stored and interpreted quickly, securely and at an affordable cost. This involves expenditure on equipment and operations, as well as putting into place the right governance and security measures. Experience has shown us that cities have to take small, manageable and measurable steps, leveraging opportunities to use smart applications to upgrade or expand services.  Budget being always a concern, cities should carefully plan these steps and make sure the approach is future-proof.

## 2.1  The NuvlaCity Solution

NuvlaCity offers a platform to host several applications to cities wishing to take a step in the smart city direction. Depending on the specific needs of the city, NuvlaCity can be deployed to provide single or multiple services, allowing cities to expand in a manageable, non-disruptive way, always leaving the option to build additional services. Depending on the type of service required, NuvlaCity makes use of data from a range of sensors. For example, cameras or ground loops can be used to understand traffic. Another example is measuring air quality or noise levels in the city. NuvlaCity delivers value in several ways, providing a pragmatic, secured and incremental solutions to cities.

## 2.2  Adaptive Street Lighting

The NuvlaCity *smart light application* optimises street lighting based on traffic volume. This service is compliant with European directive 13201-1 on public lighting and delivers cost and energy savings.

In partnership with **Schréder Swiss**, SixSq has developed the smart street lighting solution, branded **Volumlight®** by Schréder, which brings an unparalleled opportunity to deliver savings beyond those provided by typical LED installations. Cities can **reduce energy consumption by at least 30%**, whilst still respecting safety standards. With this system, lighting levels are continually updated to reflect real-time traffic patterns, providing savings during periods of low circulation yet **ensuring safety at all times**. Operational costs are also reduced thanks to its remote-control capabilities.

The **NuvlaBox**®, our smart edge device. calculates the volume of traffic using cameras and/or ground loop counters. Using this data, the NuvlaBox computes the optimal lighting intensity and sends light commands to light tele-management systems, such as Schréder's Owlet, that controls street lights.

## 2.3   Mobility

The Volumlight® solution described above relies on real-time, reliable and high-quality traffic data to function properly.

The mobility service of NuvlaCity makes further use of this valuable data. By analysing reliable real-time traffic data, it can detect anomalies such as traffic jams, raise alarms and immediately notify the relevant traffic management services.

The service can also perform traffic categorisation by distinguishing between different users of roads, such as trucks, cars and motorcycles.

Being part of the street light infrastructure, the mobility service of NuvlaCity generates traffic data continually, as opposed to systems that are installed temporarily to collect traffic data only for the period of a study.   This means **cities have continuous, real-time and high-quality traffic data**, around the clock, 365 days per year.

## 2.4   Privacy protection

NuvlaCity can provide sanitisation of all personal data collected by the sensors in order to **respect the privacy policy of the city**. Using the concept of *near data processing*, data is transformed as close to its source as possible into actionable information. This is particularly important to ensure compliance with the European GDPR regulations. Indeed, images taken by video cameras could, for example, provide information that intrudes into the private sphere of citizens (e.g. licence plates, face recognition).

The privacy protection feature of NuvlaCity performs transformation of data generated by the various connected devices as soon as possible, to **eliminate any information that could compromise the privacy of citizens**. By doing so, NuvlaCity ensures that only the data strictly needed by the city and their connected services is being stored and transmitted. This is also particularly important for open data initiatives that are growing in popularity in many cities.

## 2.5   Cybersecurity

Another service of NuvlaCity is the **continuous monitoring of cyberattack attempts** on the various sensors and devices. Many devices and sensors do not have built-in management or security capabilities. However, in our increasingly-connected world, the risk of a successful attack is real. Using NuvlaCity, cities can minimise the associated security risks, and **ensure the right people are notified as soon as a potential problem is detected**.

To limit cybersecurity threat, the following three elements can be monitored:

- **Confidentiality**: some data used by connected devices must be protected. One example is the passwords giving access to the configuration of the devices and other sensitive data.

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- **Integrity**: In the context of smart cities, data must be reliable, complete and unaltered. Indeed, by allowing decisions to be based on compromised data, the city could be led towards erroneous decisions, which depending on the services, could result in serious consequences.

- **Availability**: By making connected devices unavailable, a cyber attacker could seriously impact the behaviour of inter-related equipment, which could in turn lead to serious consequences, in particular for critical services of the city (e.g. water, electricity, etc.)

The cybersecurity service of NuvlaCity aims to minimise the security risks associated with the use of connected devices by putting adequate controls and defences in place. These include continuous monitoring of the availability of the connected devices, automated failover mechanisms, real-time detection of cyberattacks, use of digital signatures for data integrity checks, and use of cipher algorithms for data confidentiality.

## 2.6   Integration with the IT tools used by cities

NuvlaCity can be combined with the various IT tools already in use by the city. It integrates, for example, with the various public and/or private city databases. The data being collected and produced by NuvlaCity can be made available in accordance with the city's requirements.   In addition, data can be formatted to conform to required standards. NuvlaCity also integrates with the data visualisation tools used by cities, such as ESRI dashboards.

## 2.7   And more…

NuvlaCity is an open platform able to run multiple services in parallel. Some are ready-to-use, others will be put into production when needed with no disruption to existing services. This means that cities can start using NuvlaCity now and be future-proof.

Future services can either be programmed and installed by the city itself using SixSq tools or, if the city prefers, using SixSq's experienced team.

# 3   Deployment Modes of NuvlaCity

Depending on the services being used by the city and the level of performance required, NuvlaCity can be deployed in one of three modes:

- on multiple edge devices
- in the cloud
- in hybrid mode, i.e. combining cloud and edge

**The Benefits of Edge**

In most cases, the near-data processing provided by edge computing is the best option as it minimises communication costs and avoids performance bottlenecks. This is particularly important for real-time processing and for the robustness of the services, especially in a context where the number of connected objects will increase over time.    In addition, when data is analysed at the edge, real-time or near real-time analysis is possible, resulting in much faster decisions.

Edge computing ensures continuity of service, if necessary, in autonomous mode. Connection problems can have various causes, such as poorly connected geographical zones, equipment failure, power outage, cyberattack, etc.  During these incidents, data of connected devices can no longer be sent to the cloud.  The processing and storage capabilities of edge devices are such that they can operate in autonomous mode while connectivity to the cloud is being re-established. In addition, edge computing being a distributed model, a problem within an edge device only has a local and limited impact on the entire service operations.

**When cloud is the best option**

Computing power on small edge devices is limited. Therefore, when more complex analysis of big datasets is required, applications are better deployed in the cloud, and managed by NuvlaCity.

Further, cloud services are more appropriate when analytics requires information from a range of edge devices, such as trend analysis or statistics.

**Edge / Cloud Continuum: the best of two worlds**

As smart city applications scale up, opportunities will emerge where a combined edge and cloud model will become the most appropriate solution.  Combining reactivity at the edge with oversight at the cloud will become the norm.

As NuvlaCity supports both modes, customers are able to update and adapt their usage of edge and cloud as their business evolves, without needing significant changes in their business processes and practices.

# 4  Next Steps

To learn more about NuvlaCity, go to our website or get in touch with our sales team.

# 5  About SixSq

SixSq provides cloud and edge computing solutions to companies and institutions in a secured and scalable way. Our smart edge computing solution, NuvlaBox®, is a cloud-in-a-box delivered as a simple plug & play appliance for near data processing.

Managed by the Nuvla™ service, our multi-cloud management platform, users can manage clouds and edge devices, including their hosted applications, at scale.  Further, Nuvla ensures out of the box and end-to-end security at an affordable price. Nuvla can also be deployed on premise, providing a complete private solution.

Packaged in the NuvlaCity solution, Nuvla and NuvlaBox can play an intrinsic part in any smart city and IoT strategies.

SixSq is a member of the RHEA Group, a leading supplier of systems engineering services and software solutions to the Aerospace and Security industries.

**Useful links:**

Website: https://sixsq.com

NuvlaCity: https://sixsq.com/nuvlacity

NuvlaBox: https://sixsq.com/nuvlabox

Nuvla: https://sixsq.com/nuvla

Sales team:

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