RUGGEDISED
Designing smart, resilient cities for all

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# Executive summary

In October 2019 the first fourteen smart lampposts are installed in the Heart of South area in Rotterdam. These lampposts are equipped with LED lighting and a so called telemanagement system. Initially the Smart Lighting solution would be executed with the KPN LoRa network. In the final design of the Smart Lighting another system has been chosen, namely a telemanagement system by Signify.

The use of telemanagement has several advantages: automatic notifications about malfunctioning from each individual lamppost, a central maintenance management system and remote control of the lighting. Apart from that the technical development of telemanagement is increased through the years. Instead of a traditional antenna, these luminaires are equipped with smart connectors named Zhaga book 18.

Upgrading or updating the lampposts with new or different modules is easily possible. To a lamppost equipped with an air quality sensor, a camera can be added some years later without replacing the whole lamppost.

The municipality of Rotterdam has started to install smart lighting in other areas of the city. All smart lighting with telemanagement will be installed with the Astrin Lighting interoperability Standard (AliS) protocol. Herewith all public lighting hardware from multiple vendors can be controlled through a single portal.

# Contents

# 1. Introduction

The construction, design and maintenance of public space like roads, dikes, bridges, lighting and so on is an important task of the city of Rotterdam. Besides that, the city has also a general task in facilitating and guiding urban development through, amongst others, making investments in public space, houses, offices, cultural buildings, possible. Within the RUGGEDISED project, the city of Rotterdam, is responsible for several activities. The renovation of the public space with smart lighting, smart waste management, the development of the 3D-city operations model and the installation of e-car charging stations are some of the main activities. This document is about the implementation of efficient and intelligent street lighting in the Heart of South area in Rotterdam.

## 1.1. Technical description

The lamppost being used within the HoS retains, serves and enhances the principal compliance obligations of street lighting (wayfinding, public safety). By using LED lighting, they use low-emission luminaires. They are connected as a network, enabling system-wide controllability (e.g. central management system), and integration of sensors that extend services and have 24x7 power to enable continuous smart services.

These lampposts are equipped with:
– Small connector so that integration into street lighting is easier
– Suitable for all mounting directions
– Equipped with standard fitted connections so that interchangeability is guaranteed
– Suitable for low voltages so that the development of sensors and communication becomes easier
– Standardized protocol to communicate with the driver
– Universally applicable so that there will be sufficient competition on applications

The benefits of this sensor system are the following:
– If a module is defective, easy repairs can be made
– No obligation to immediately equip all luminaires with modules “afterwards” inserting a module has become a breeze
– Upgrading or updating is easily possible by replacing some of this module. For example: after some years adding a camera to a luminaire with an air quality sensor is a possibility.

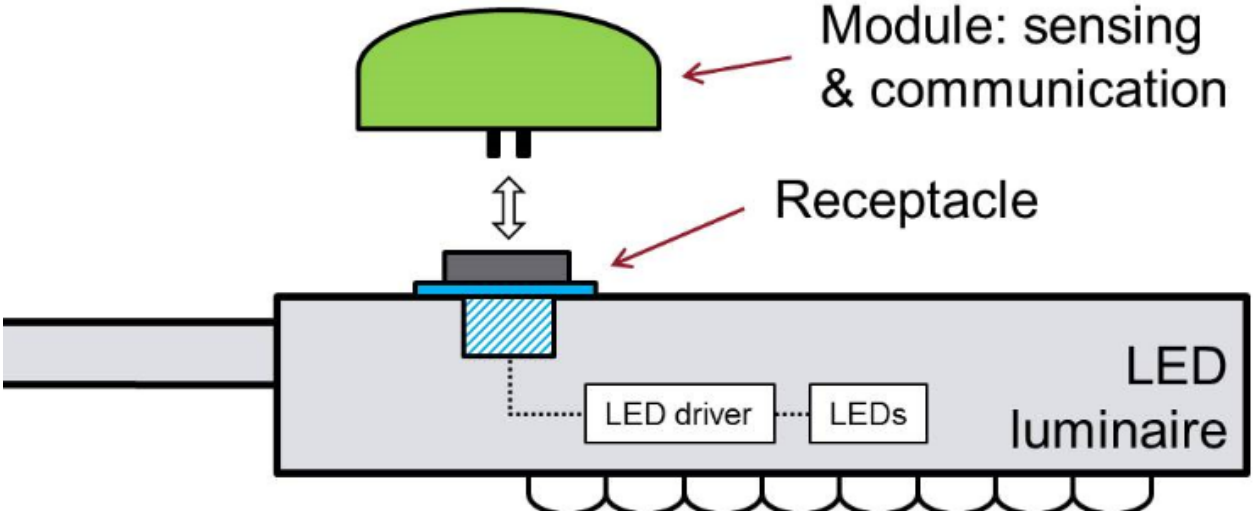


Figure 0-1 Scheme of the luminaire.

Several advantages of telemanagement can be mentioned. One is that each lamppost gives notifications about malfunction automatically. Combined with a maintenance management system all notifications about malfunctioning of the lampposts can be monitored and automatically a maintenance team can be sent to the lamp post. Passers-by don't have to make a notification to the municipality about malfunction of one of the lampposts and the civil servants don't have to check all lampposts from time to time. Another advantage is remote control of the lighting. For every moment of the day the light intensity can be adjusted. Also, during rush hour or when there are events in the area the lighting can be increased if necessary and decreased during nighttime or quieter period.

Then there is also the technical development of telemanagement. In former times every luminaire was equipped with an antenna. This was time consuming, expensive and there was no guarantee on the functioning of the antenna and the luminaire. Nowadays the luminaires in the Heart of South are equipped with so-called Zhaga book 18 connectors.
This connector is a standard solution for sensoring techniques and telemanagement. Therefore it is not necessary to do extra maintenance to the luminaire. For this area the Signify system has been chosen. Usage of a separate gateway is not necessary with Signify telemanagement products. These products register itself by GPRS and are provided by GPS location sensoring.

The first fourteen lampposts are installed in October 2019. All lampposts are equipped with LED lighting and a telemanagement system. Telemanagement is a longer existing system, which means that all lampposts connected to this system are linked to each other and can be remote controlled. However, the introduction of LED lighting has made telemanagement much more applicable, because LED lighting can be dimmed very well.

Initially the Smart Lighting solution would be executed with the KPN LoRa network. The LoRa network ensures that Wifi or, nowadays still expensive, 4G are not required. In the final design of the Smart Lighting in Heart of South, another system has been chosen, namely a tele management system by Signify. There are two main reasons the LoRa network is not necessary for this solution. First, there is a continuous power supply to the lampposts. Second, the amount of continuous send data is too high for the LoRa network. LoRa is only capable of sending little amounts of data periodically.

Also monitored is the energy use of the luminaires. The energy use data can be fed into the 3D model of the digital twin to provide insight in their performances.

Figure 0-2 Image of the luminaire placed in the Heart of South area.

# 2. Methods and results

In the following figure all data from the luminaires is shown. The daily energy consumption as well as the total energy consumption is shown. So far no failures have been reported, but when something is not right with one of the lampposts this will be shown in the same portal.

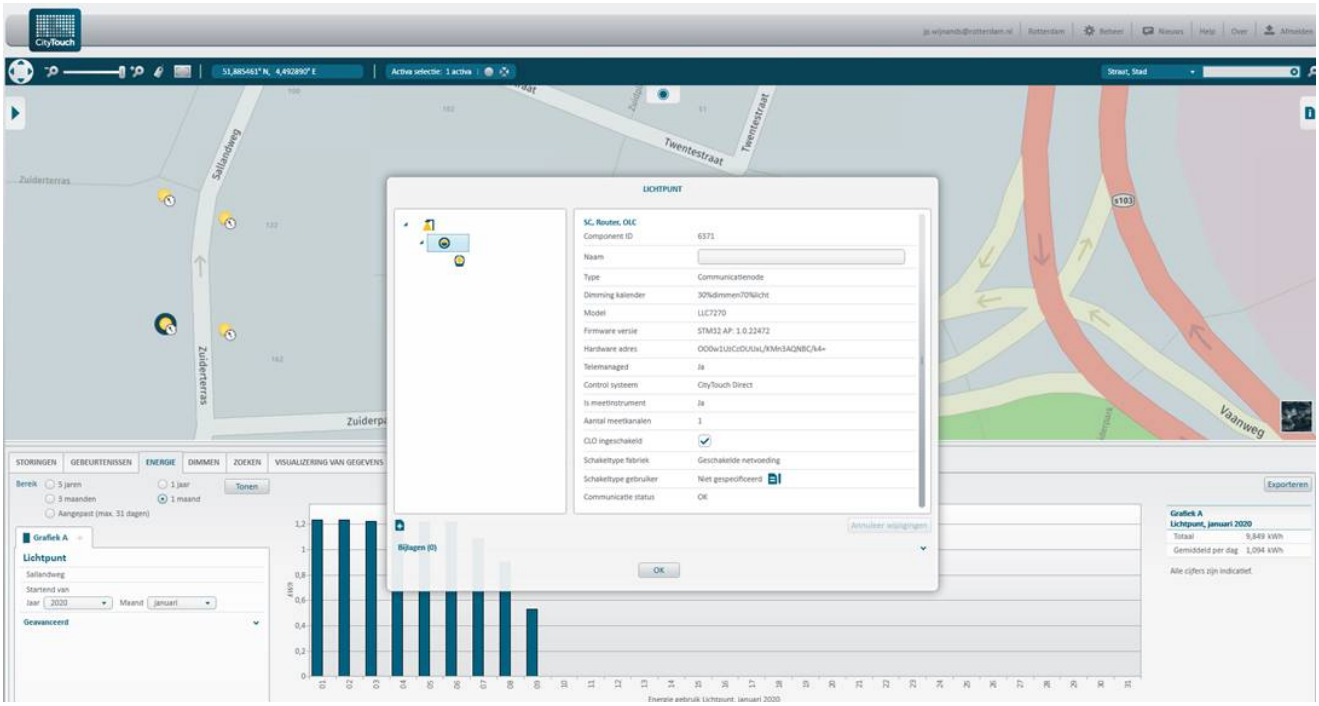


Figure 0-3 All data from the luminaire is shown in the CityTouch platform.


Figure 0-4 Recently placed smart lighting in Heart of South. In the background the Ahoy complex and the new ICC.


Figure 0-5 and 1-6 recently placed smart lighting in Heart of South.


Figure 0-7 recently placed smart lighting in Heart of South.

# 3. Discussion and Conclusions

In the Heart of South area, the smart lighting is and will be placed by Heijmans and Ballast Nedam, building contractors for all the (re)development in this area. The municipality is learning lessons from this development. In other areas of the city the municipality itself has started placing smart lighting. In all city districts where the telemanagement will be installed the so-called ICT protocol AliS (Astrin Lighting interoperability Standard) will be supporting this. Herewith all the public lighting hardware from multiple vendors can be controlled through a single portal. The aim is to spread this technology across the city. Which should lead to a citywide reduction of energy use of 50 to 70% and estimated monetary savings of € 12 million. Additionally, a yearly CO2 reduction of 104 ton with the proposed smart lighting, when installed in the whole city, can be expected.

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