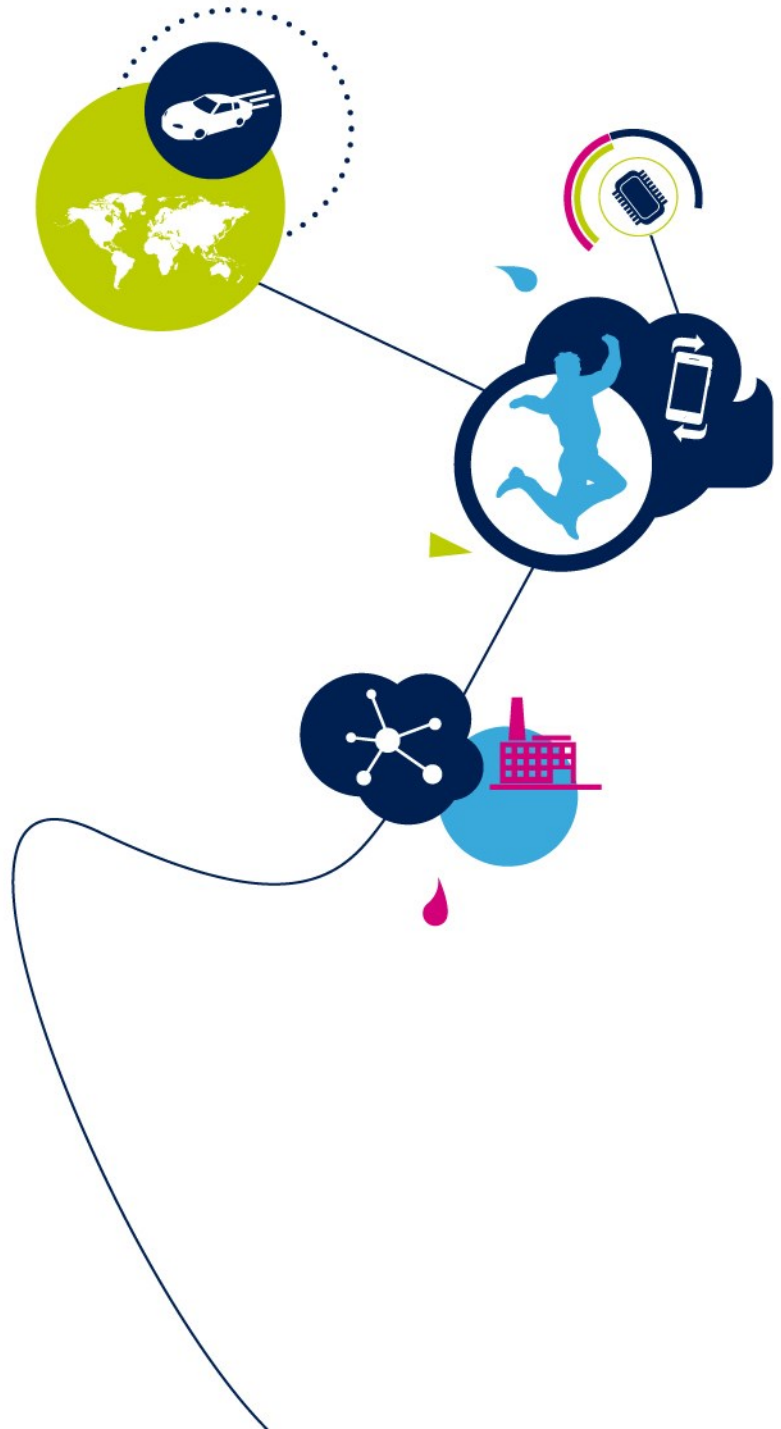
Smart Cities Solution

Raunaque M QUAISER



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Who We Are

- A global semiconductor leader
- 2017 revenues of **$8.35B** with year-on-year growth of **19.7%**
- Listed: NYSE, Euronext Paris and Borsa Italiana, Milan

- Research & Development
- Main Sales & Marketing
- Front-End
- Back-End

- Approximately **45,500** employees worldwide
- Approximately **7,400** people working in R&D
- **11** manufacturing sites
- Over **80** sales & marketing offices

As of December 31, 2017

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Why Smart Cities?

Increasing urban density and changing demographics

2030 Demographic Dynamics

More than 8 billion people
More than 60% living in the cities
65+ generation will nearly double

Increasing challenges on resource management

Scarce Resources

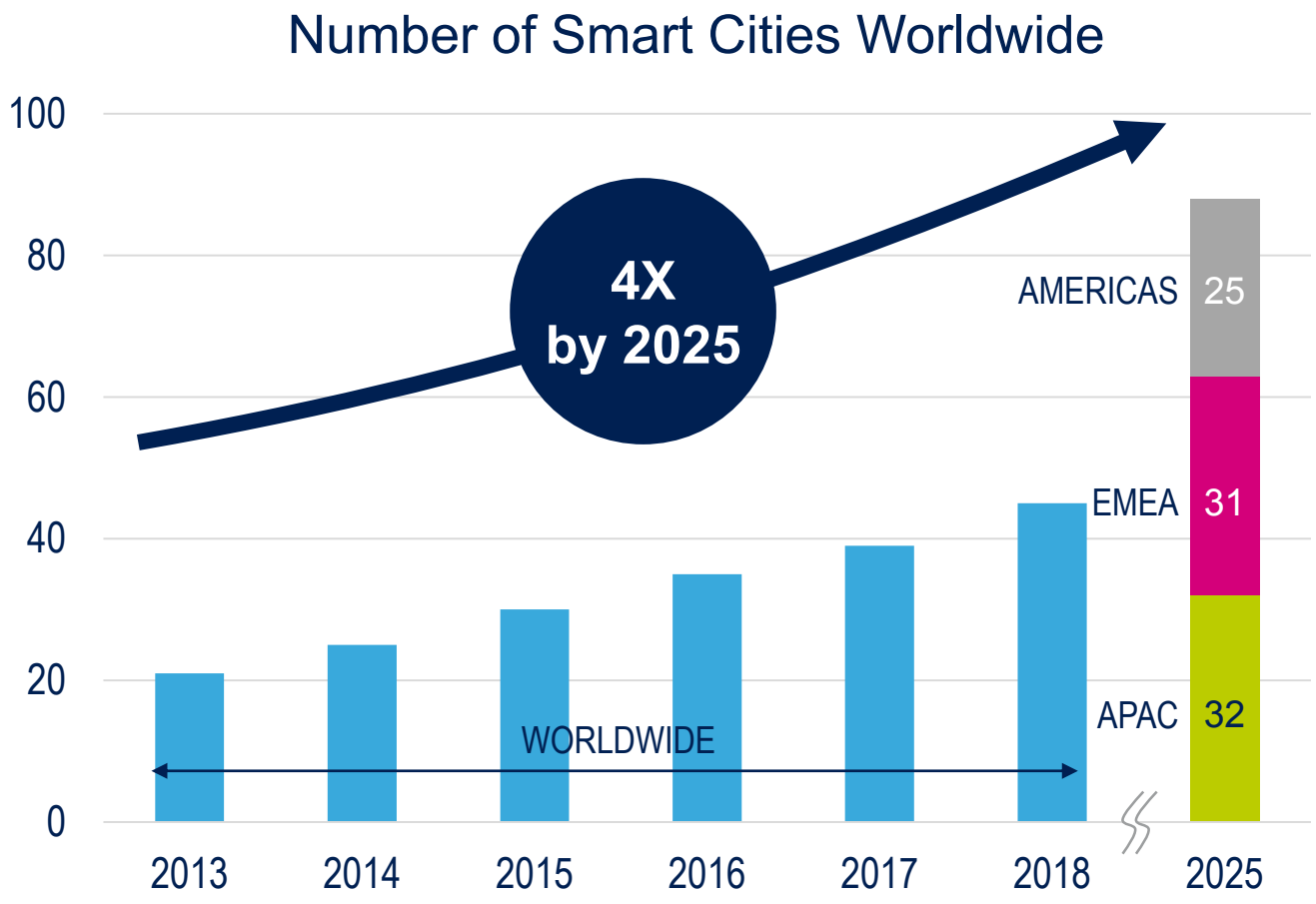
Finite oil and gas reserves
Water shortages in large urban areas
Waste treatment & disposal challenges

Demand for clean energy

Climate Change

Programs focused on long-term reduction in CO2 emissions
Improve the quality of city life

The Rise of Smart Cities



EMEA has the largest number of Smart Cities today

APAC will take the lead in 2025

US projects often focus on a single functional area, typically mobility and transport

Annual investments on Smart City projects was ~1B$ in 2013 and expected to be >12B$ in 2025

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Sources: IHS research

Smart Cities

Europe

Copenhagen

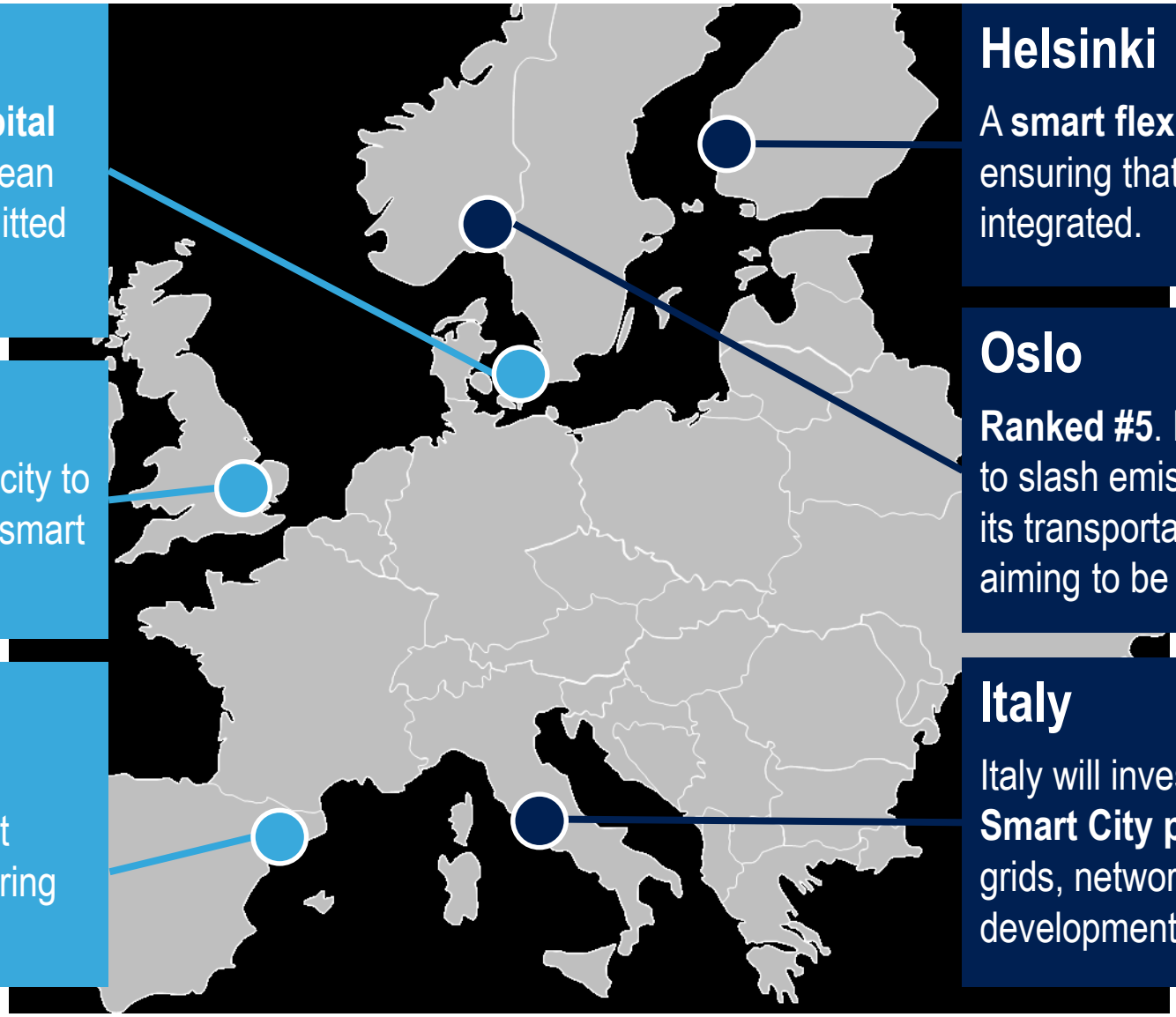
Considered to be the **greenest capital** city **in the world**, it's a center for clean technology innovation and is committed to being **carbon neutral by 2025**.

London

Ranked #3. Cohesive effort by the city to reduce congestion: Smart parking, smart transportation.

Barcelona

Ranked #2, It has installed smart parking technology as well as smart streetlights, and sensors for monitoring air quality and noise.



Helsinki

A **smart flexible municipal grid** is ensuring that renewable energy is better integrated.

Oslo

Ranked #5. By 2020, the city is aiming to slash emissions by 50% by remaking its transportation grid; by 2030, it is aiming to be **95% climate neutral**.

Italy

Italy will invest **65 million euros in Smart City projects**, including smart grids, network infrastructure and development of services.

Ranking Sources: Juniper research

Smart Cities

Americas

Seattle

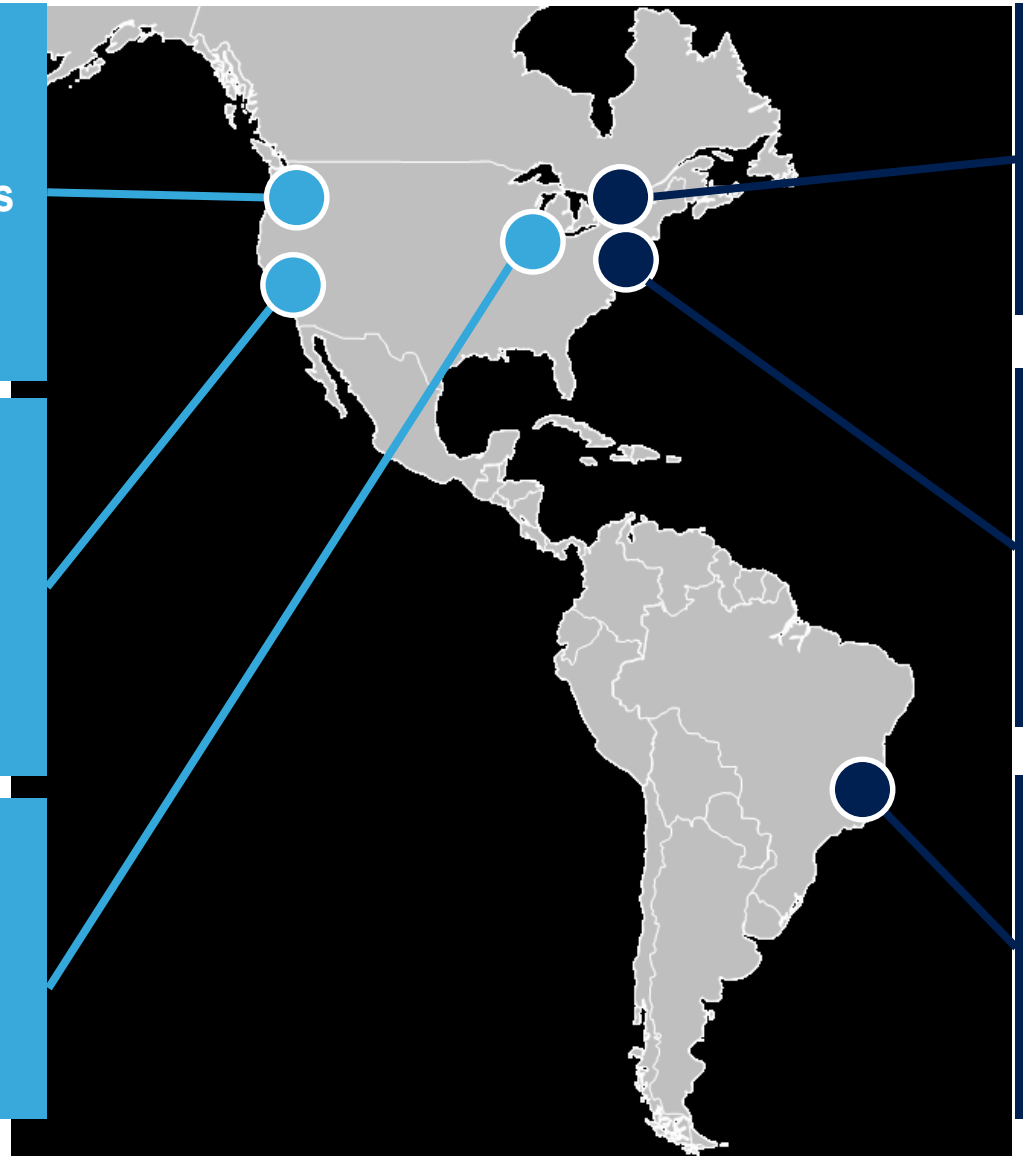
Partnering with the University of Washington to develop **smart solutions** for a variety of urban challenges.

San-Francisco

Ranked #4, leader in terms of **smart parking**. The SF Park initiative, which was launched in 2011, leverages sensors to monitor parking spaces.

Chicago

Moving ahead with its **Array of Things** project, which will install **500 sensor nodes** on its streets.



Toronto

Smart Commute Toronto initiative to increase transit efficiency in the metro area.

New-York

Technology solutions for **regularly occurring problems**, such as preventing fires and stopping government fraud.

Rio de Janeiro

The city has seen a lot of infrastructure development recently, thanks to the 2016 Olympics.

Ranking Sources: Juniper research

Smart Cities

ASIA

Xinjiang

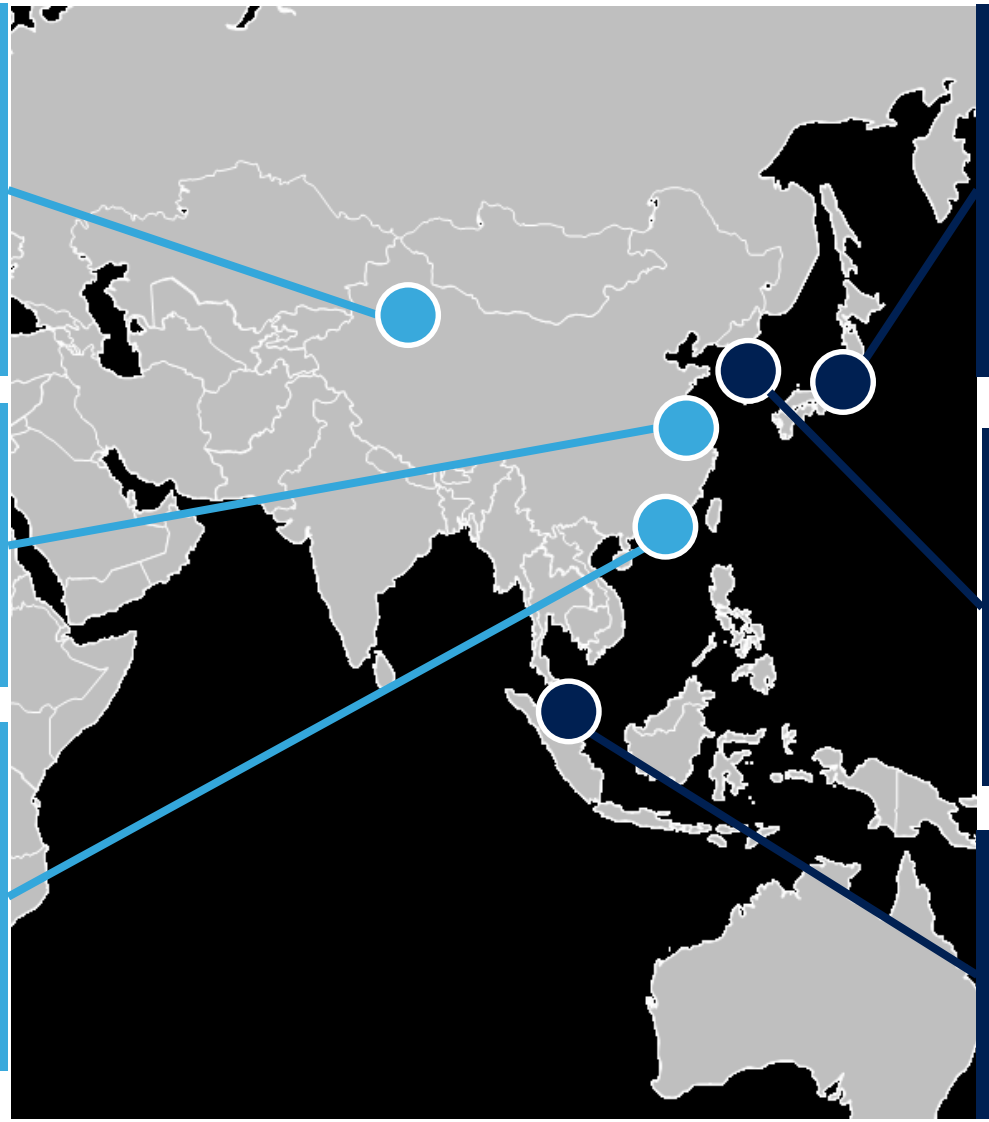
Bus station equipped with an electronic screen displaying bus arrival information. A **web** of **public traffic cameras** accessible via smartphones.

Nanjing

Smart traffic analytics using advanced analytical algorithms enable the city of Nanjing to make sense of its big data.

Hong Kong

Highest **smartphone** penetration in the world with **contactless card payment** in public transport, usable at restaurants, parking lots and vending machines.



Tokyo

Ambitious program to develop **energy-efficient** business, industry and homes, support for green consumer behavior, and a low-carbon transportation system.

Seoul

OLEV allows electric public buses to be **charged as they move**. U-healthcare service provides **telehealth check-ups** and medical consultations.

Singapore

Ranked #1, with a **world leading transportation network** as well as **wireless connectivity** services.

Ranking Sources: Juniper research

Making Cities Smarter

What Smart City means

- Smart city infrastructure to improve traffic and municipal services
- Smart Grid
- Intelligent, adaptive street lighting
- Smart Buildings

Smart City
Key Directions

More Efficient

Higher efficiency at all points in power generation and distribution

More efficient power consumption

More Intelligent

Using all available data to adapt infrastructure and services for the benefit of the citizens

More Connected

Smart City and Home devices connect to one another and to the cloud

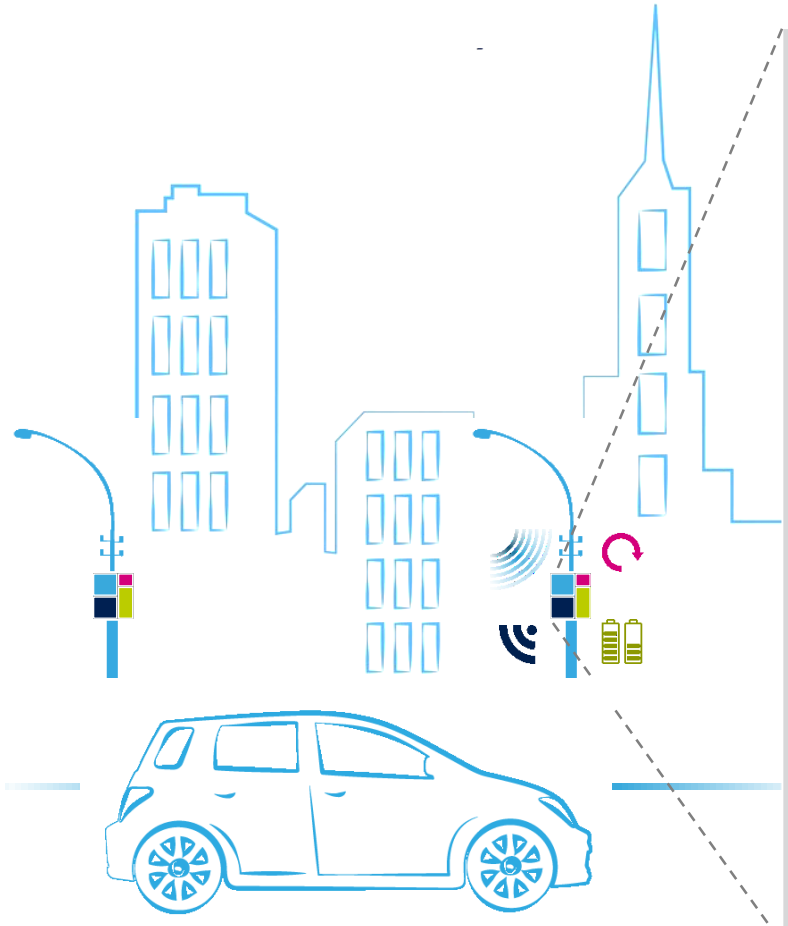
All communications are secured

More Aware

Sensors collecting information about every node in the city

Homes are aware of their inhabitants and adapt living conditions to optimize comfort and energy saving

Smart Street Lighting



Smart Sensing

- Motion MEMS
- Acoustic MEMS
- Environmental sensors (Light, Temperature, Humidity, UV)

Processing

- STM32 32-bit MCU

Connectivity

- Wi-Fi module
- STarGRID™ PLC
- Bluetooth module
- Sub-GHz SPIRIT1

Energy management

- Digital power management
- Energy harvesting ICs
- Power MOSFET

Infrastructure evolution using **smart sensor nodes** enabling **new services** like traffic monitoring, weather station, improved security

Remote activation and dimming control for energy saving

Lamp failure monitoring

Connected monitoring station for air quality, security and traffic

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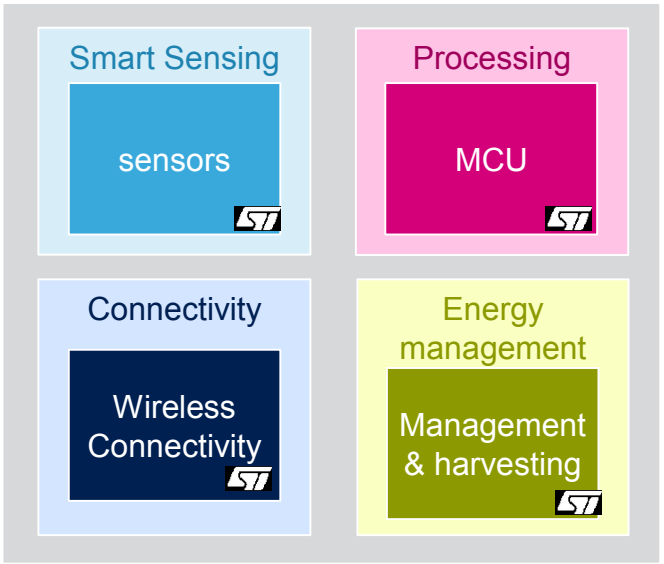
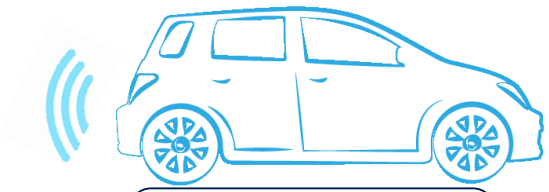
Smart Parking

Car detection sensor embedded in the road





Radar and camera assisted parking

Helping drivers to find a parking spot faster and enabling cities to manage their parking spaces more efficiently

Less time = less fuel = less emissions

Reducing congestion

Parking space owners get better control and pricing flexibility

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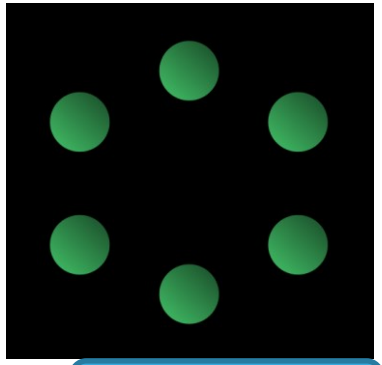
Smart Lighting

Solar Smart Street Light Solution (1/4)



6LoWPAN Mesh Network

Data Concentrator Unit to Cloud

Solar Smart Streetlights

Cloud based control

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Solar Smart Street Light Solution (2/4)

Solar Smart Street Light Solution (3/4)

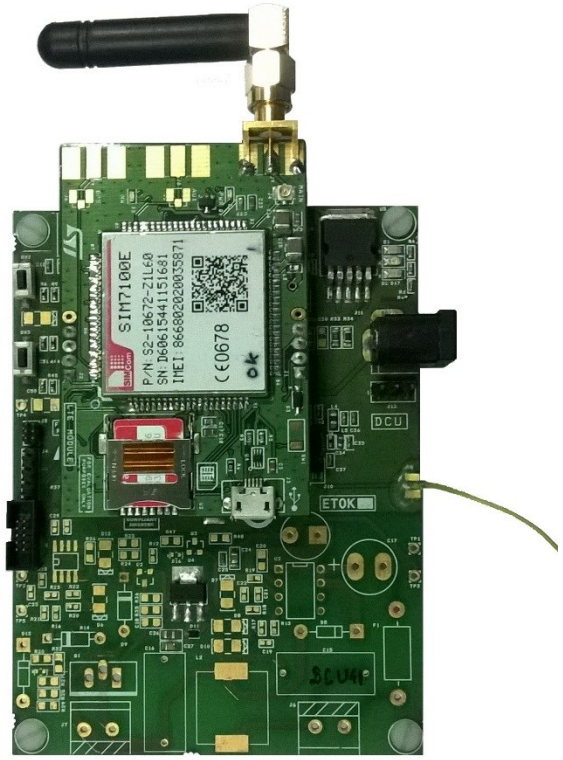
Node Name	IPv6 Address	Batt Volt (V)	Panel Volt (V)	RSSI (dB)	Switching Request	Node Status
P29	aaaa::3338:3138:7d34:6d0c	13.9	15.7	-74	Turn On Light	OK
P21	aaaa::3b37:3138:5234:7515	14.1	18.7	-74	Turn On Light	OK
P17	aaaa::3338:3138:7734:850c	14.1	16	-74	Turn On Light	OK
Unknown	aaaa::3338:3138:7b34:6d0c	13.7	15.7	-74	Turn On Light	OK
P02	aaaa::3b37:3138:5534:6c15	13.6	15.4	-80	Turn On Light	OK
Unknown	aaaa::3b37:3138:5334:6215	14	15.9	-81	Turn On Light	OK
Unknown	aaaa::3338:3138:7f34:7d0c	13.5	17.1	-68	Turn On Light	OK
P20	aaaa::3b37:3138:5134:6815	14.1	18.7	-74	Turn On Light	OK
P25	aaaa::3b37:3138:5534:7c15	14.1	15.7	-74	Turn On Light	OK
P26	aaaa::3b37:3138:5234:7715	14.2	17.5	-74	Turn On Light	OK
P14	aaaa::3b37:3138:5534:7015	14	15.9	-75	Turn On Light	OK
Unknown	aaaa::3338:3138:4a34:7d0d	5.3	4.9	-51	Turn Off Light	On Mains
P24	aaaa::3730:3137:6c33:8719	14.1	15.8	-75	Turn On Light	OK
P10	aaaa::3b37:3138:5434:6715	14.1	16	-74	Turn On Light	OK
Unknown	aaaa::3338:3138:7b34:6f0c	5.3	5.3	-73	Turn Off Light	On Mains
P13	aaaa::3b37:3138:5734:8d13	10.8	11.9	-74	Turn Off Light	On Mains
Unknown	aaaa::3338:3138:7a34:810c	13.8	15.7	-81	Turn On Light	OK
P18	aaaa::3338:3138:7734:830c	13.9	15.8	-74	Turn On Light	OK

Unknown : Nodes connected with another DCU for Internal testing

Last updated on : 1:43:55 PM | Last DCU Request at : 1:43:54 PM

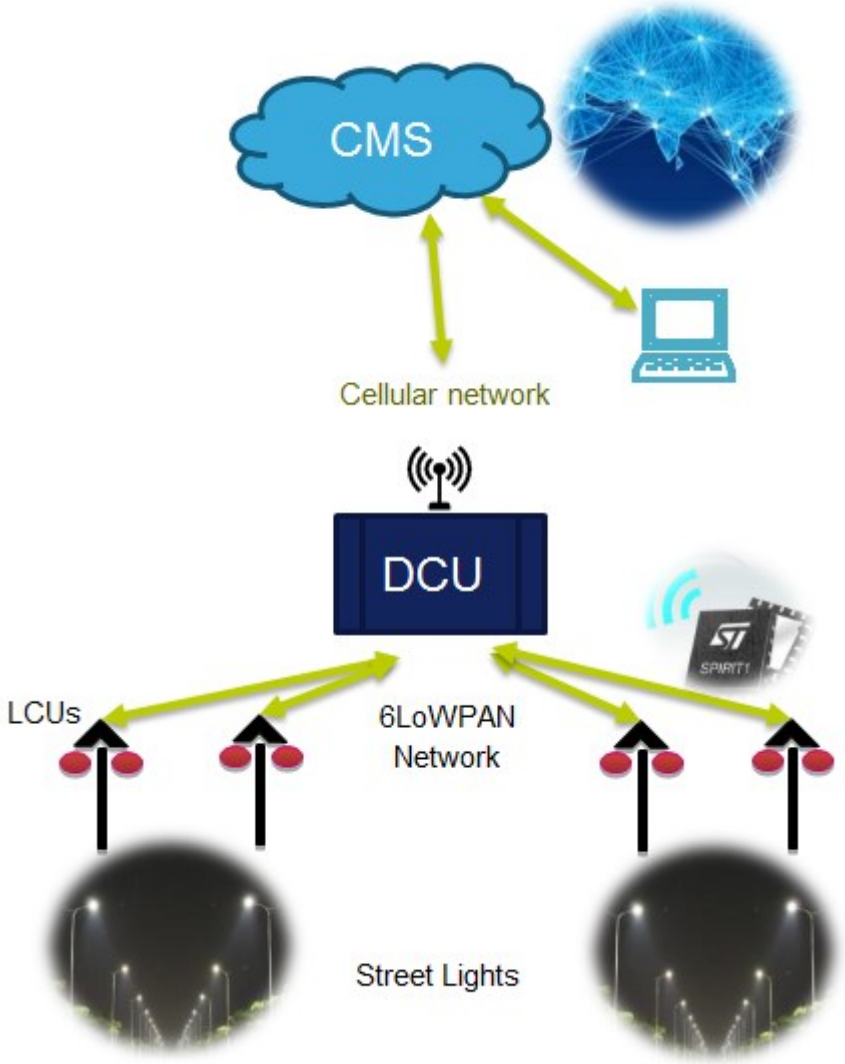
Schedule : | On Time HH:MM | 00:00 | Update On/Off Time

Solar Smart Street Light Solution (4/4)



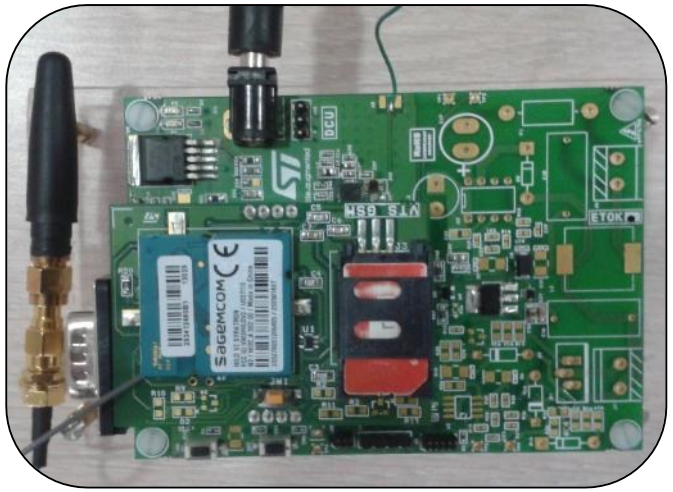
Data Concentrator Unit

Solar Smart Street Lighting

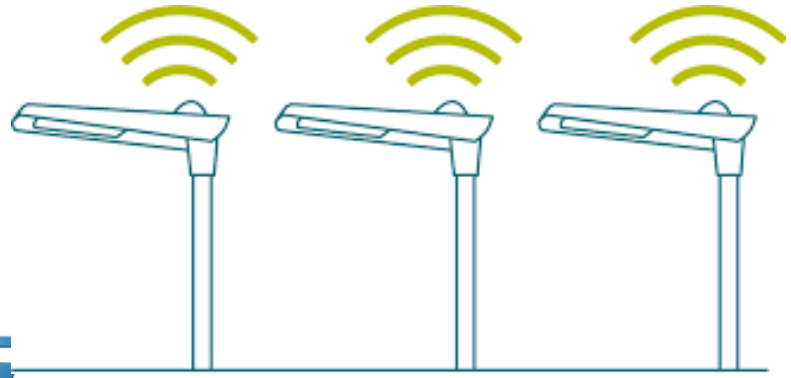


- Solar based connected LED street light solution over 6LoWPAN technologies
- Data concentrator unit (DCU) that controls a group of street lights nodes (LCU) over 6LoWPAN Mesh protocol
- DCU updates data over cloud through GPRS
- Command and Control Centre to monitor and control individual / group of street light nodes

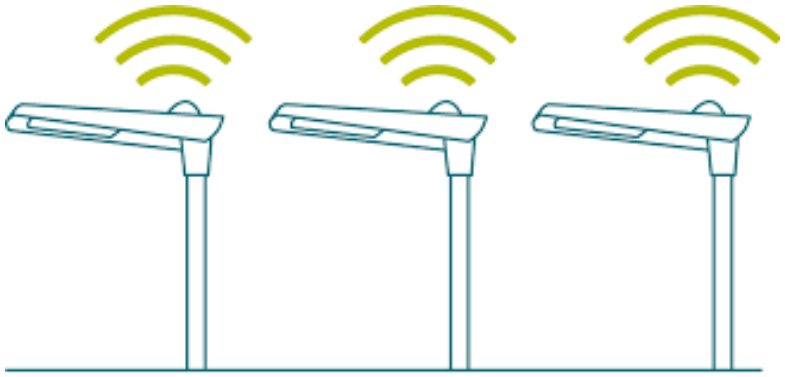
Data Concentrator Unit



- DCU with on-board GSM module to communicate with Cloud application using GPRS communication
- Control and scheduling of individual streetlight and streetlights as group
- Voltage, current and other sensing parameters is reported by DCU to Cloud Application
- 6LoWPAN wireless mesh communication between LCU & DCU



Lamp Control Unit

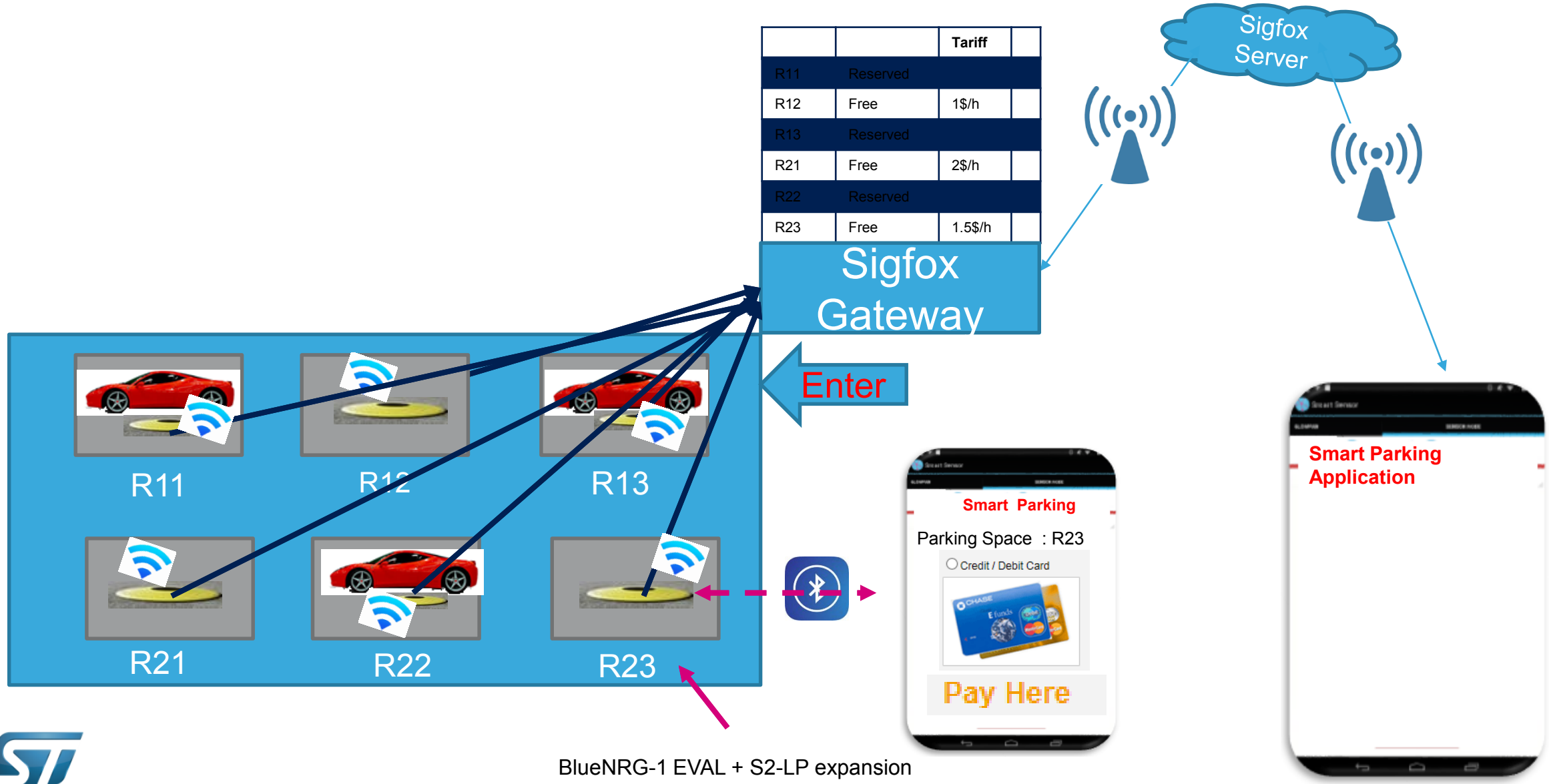


Street Light Nodes

- The LCU or Street Light nodes talks to each other over 6LoWPAN mesh technology @ 865-867 MHz
- LCU is powered both by mains and solar panels
- Auto switch on-off of the lights by sensing the ambient light
- The light nodes can also be individually controlled by the Central Monitoring System

Smart Parking

Smart Parking (1/3)



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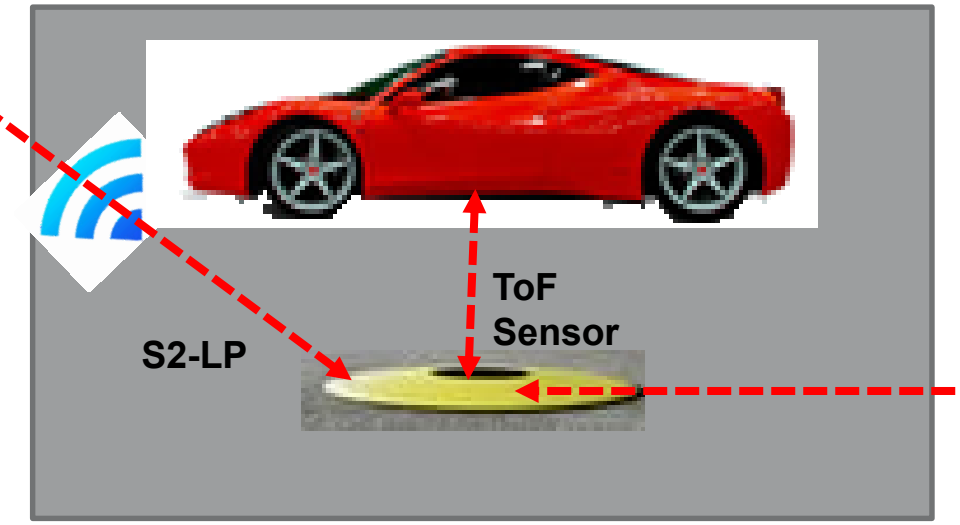
Smart Parking (2/3)

		Tariff	
R11	Reserved		
R12	Free	1$/h	
R13	Reserved		
R21	Free	2$/h	
R22	Reserved		
R23	Reserved	1.5$/h	

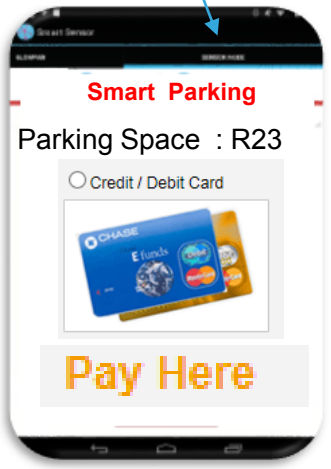
Sigfox Gateway

payment gateway



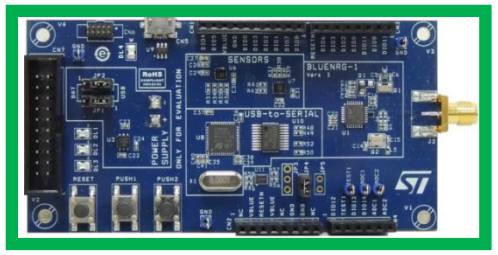
R23

BLE Chat : 2-way communication between two blueNRG-1 devices

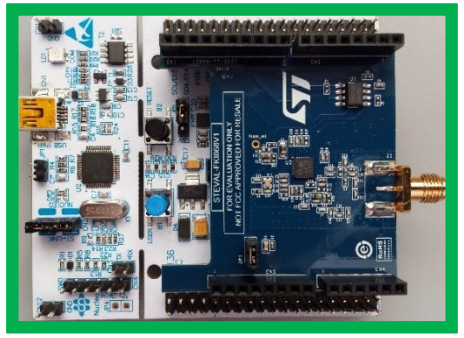


Smart Parking (3/3)

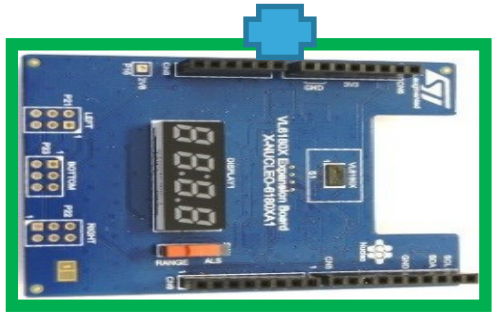
Smart Parking Sensor Node



STEVAL-IDB007V1



STEVAL-FKI868V1 (SPI Interface)



X-NUCLEO-6180XA1 (I2C Interface)

Smart Parking

- Sensor to detect the presence of the car in the parking slot. Time of Flight device detect the empty or busy slot
- The availability of the empty slot is communicated to the Cloud Application via Sigfox. LoRA can also be used in place of Sigfox
- Payment can be done once the car is parked using a mobile App
- Bluetooth Low Energy communication can be used to ensure that the person has come really to parking slot before the booking initiated
- The tariff can be shown for each of the parking slot

Thanks