

JCCI International Seminar 2024

Introduction of **Smart Lighting & Smart City Solutions**

Contributing in Development of Zero Carbon Society

Smart City Promotion
2024 February

MinebeaMitsumi
Passion to Create Value through Difference

SMART
CITY
SOLUTIONS



Contents

MinebeaMitsumi
Passion to Create Value through Difference

1

Overview of
MinebeaMitsumi Business

2

Overview of
Smart Lighting technology

3

Smart City Solutions by MinebeaMitsumi

1

MinebeaMitsumi
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Overview of MinebeaMitsumi Business

1. MinebeaMitsumi Business Overview

Toward becoming a one-of-a-kind **INTEGRATION** manufacturer of precision components by maintaining a diverse portfolio

Consolidated Net Sales

1,292,203 million yen

Operating income

101,522 million yen



Precision Technologies Business

197.3 billion yen
composition **16%**

Main Products

Ball bearings,
rod-end bearings,
spherical bearings,
fasteners,
pivot assemblies



Motor, Lighting & Sensing Business

366.2 billion yen
composition **28%**

Main Products

HDD spindle motors,
stepping motors,
fan motors, DC motors,
LED backlights,
resonant devices,
sensing devices



Semiconductors & Electronics

530.4 billion yen
composition **41%**

Main Products

Precision components,
optical devices,
power supplies,
mechanical components,
automotive products,
analog semiconductors

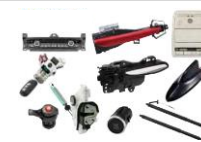


Access Solutions Business

194.6 billion yen
composition **15%**

Main Products

Automotive parts (door latches, door handles, etc.),
industrial machinery components,
components for home security units (house and general buildings' locks and others)



* Net sales of 3.0 billion yen for Other business is omitted here.

*INTEGRATION means "combining" rather than "simple gathering" of the Company's proprietary technologies to create new products in various fields through the INTEGRATION of our advanced technology.

2

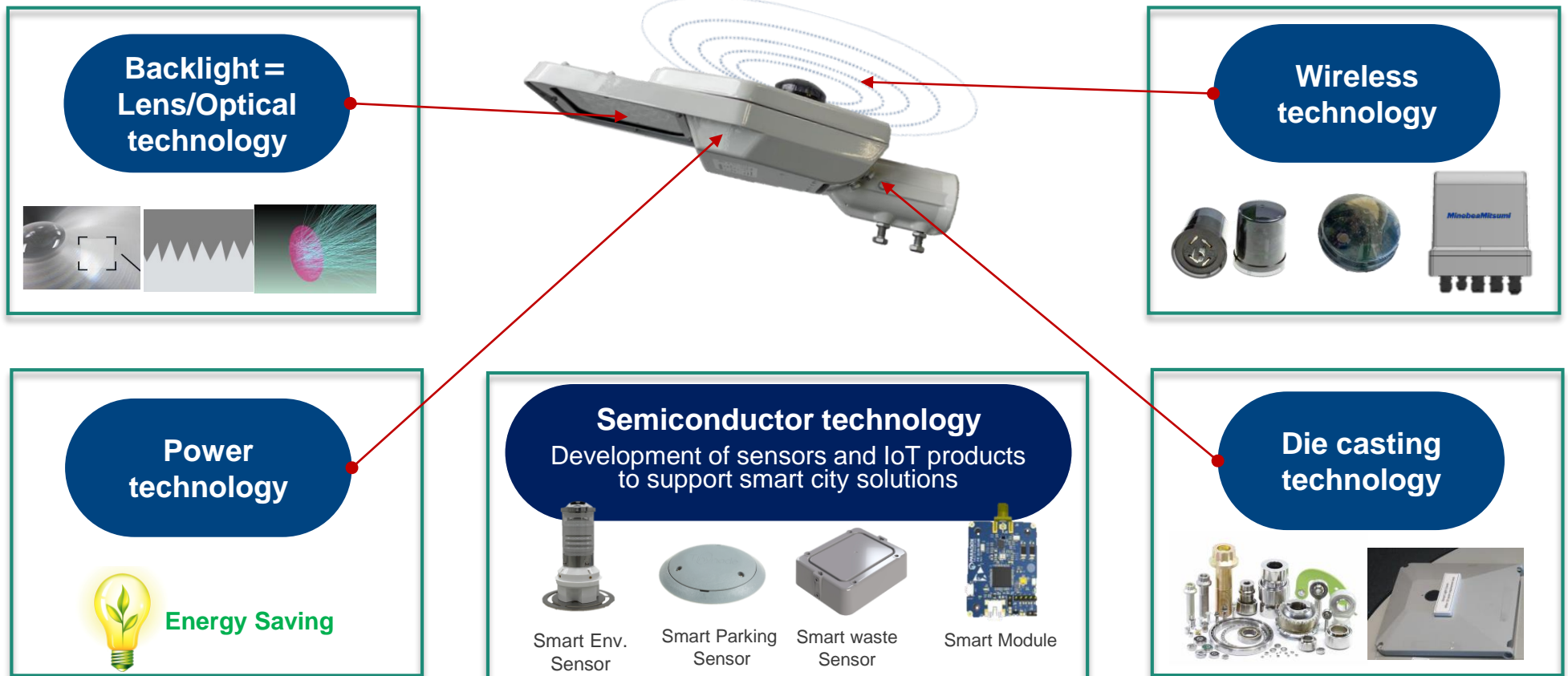
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Overview of Smart Lighting technology

2. Overview of Smart Lighting technology

Synergy of MinebeaMitsumi technology

Integration of MinebeaMitsumi's original technologies and IoT technology toward development of smart lighting and smart city solutions.



2. Overview of Smart Lighting technology

Our Smart Lighting technology not only provide high efficiency and customized lighting solution, but also provides easy expendability toward a real Smart City.



①

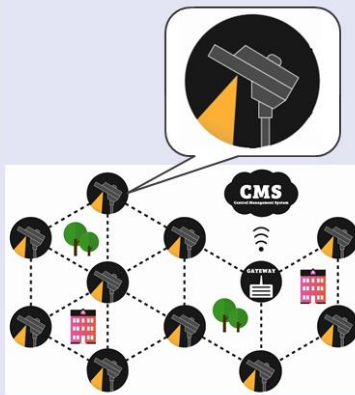
Efficient Lighting



High Efficiency Lighting and Dimming Control

②

Wireless technology



Robust and effective wireless mesh network based on 6LoWPAN

③

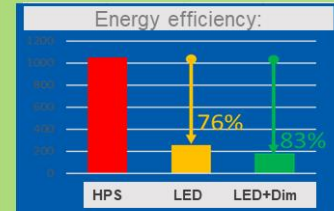
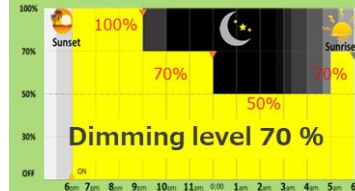
Centralized management



All devices can be centrally managed and controlled from a same CMS.

④

Energy Saving & GHG emission reduction



Energy efficient LED lamps + Dimming control

⑤

Expandability

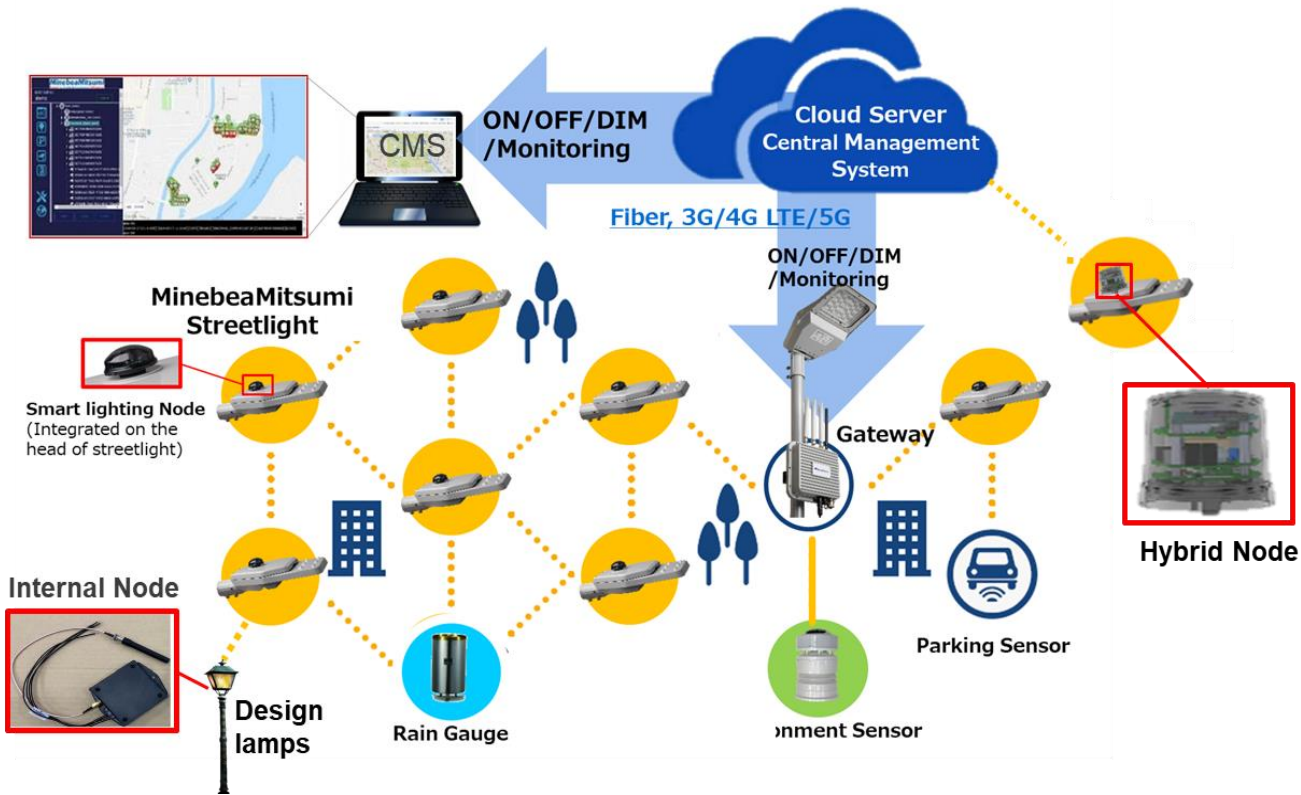


Can add new IoT devices to the same network platform to expand smart solutions

2. Overview of Smart Lighting technology

Our smart city wireless network is based on 6LoWPAN that is robust and resistant to obstacles.

Here, our Gateway supports dual network communication to each IoT device individually. IoT devices that uses low volume of data packets and other devices such as security camera that require high volume of data packets are supported by the same Gateway device.



Network Platform : 6LoWPAN

Can withstand adverse events such as gateway outage.

6LoWPAN builds communication networks by **hopping** communication nodes on streetlights.

If the gateway does not work, the communication node builds a new network, and automatically connects to another gateway.

Network Platform : LoRA (under dep.)

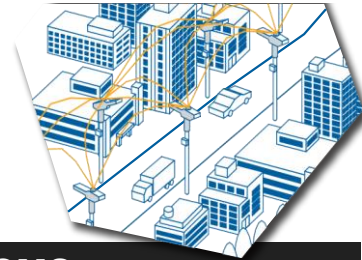
The parent unit communicates with the devices/sensors on a one-to-one basis.

•6LoWPAN allows to connect all sorts of IoT devices to an IP network and transmit IPv6 data packets end to end across a low power wireless network.

2. Overview of Smart Lighting technology

Real time monitoring and data collection to facilitate instant sharing of any occurrence

CMS can centrally manage smart lights and IoT devices connected to the network, so it is possible to improve the efficiency of operation management.



Preview of network of IoT devices on CMS

MinebeaMitsumi Narrowband Network monitor
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This web application enables you to monitor your network on maps

Zones: Diamond Island (Asia/Bangkok +7 DST off) PE_GW_172.17.1.67 (CONNECTED)

Device only created *

- Root (No gateway)
- Unassigned
- [Removed]
- Japan
- Philippines
- Cambodia (No gateway)
- Diamond Island (3 gateways)
 - PE_GW_172.17.1.131 (No device)
 - PE_GW_172.17.1.135 (3 devices)
 - PE_GW_172.17.1.139-NB-Elysee (73 nodes)
 - PE_GW_172.17.1.163 (No device)
 - BASE_DEVICE-00_00 (0)
 - D-029 (0)
 - D-030 (0)
 - D-031 (0)

Search node: D-096 [84:84:33:01:03:25:46:37]

Status

The screenshot shows a map of Diamond Island with a central gateway (PE_GW_172.17.1.67) and numerous IoT devices (represented by green 'P' icons) connected to it. The map includes labels for various buildings and landmarks like Diamond Twin Tower, Koh Pich City Hall, and Aquation.

2. Overview of Smart Lighting technology

Dimming control : What is dimming?

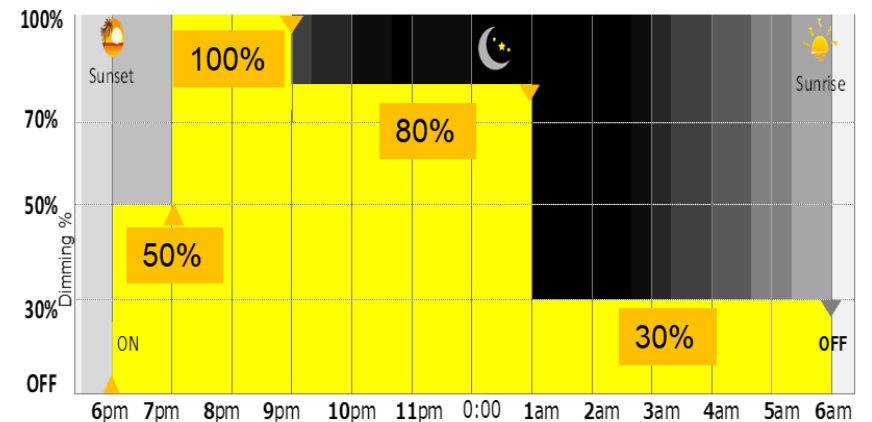
We offer advanced lighting system that significantly helps in energy savings by applying dimming control to provide optimum brightness on road depending on the traffic volumes and people`s activities.



■ Comparison of brightness at various dimming level



■ Example of customized dimming pattern

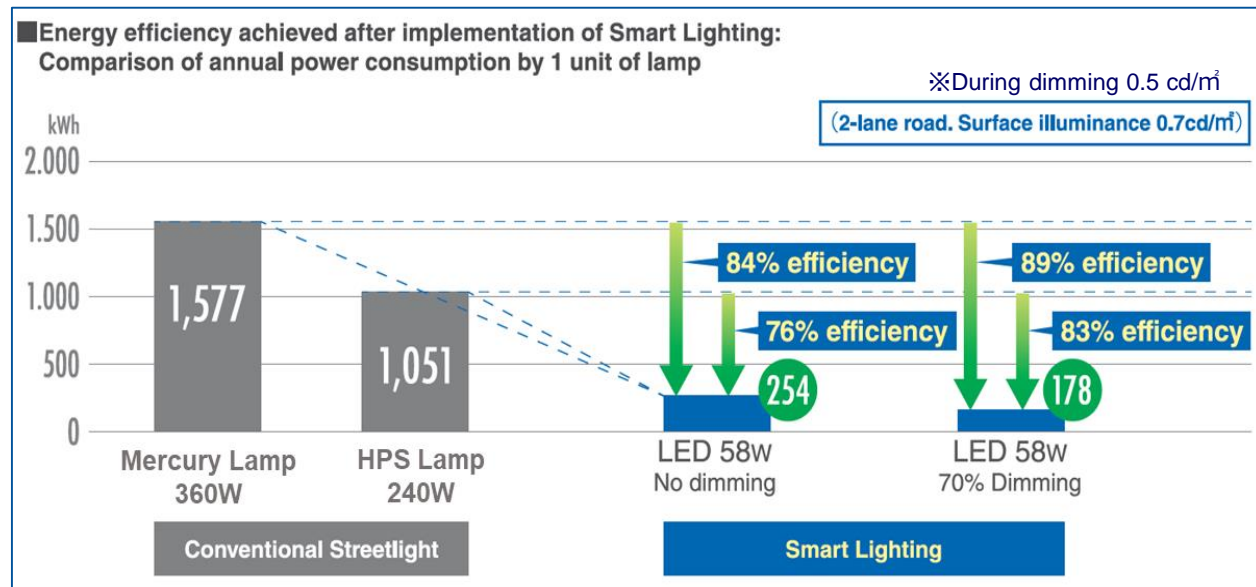
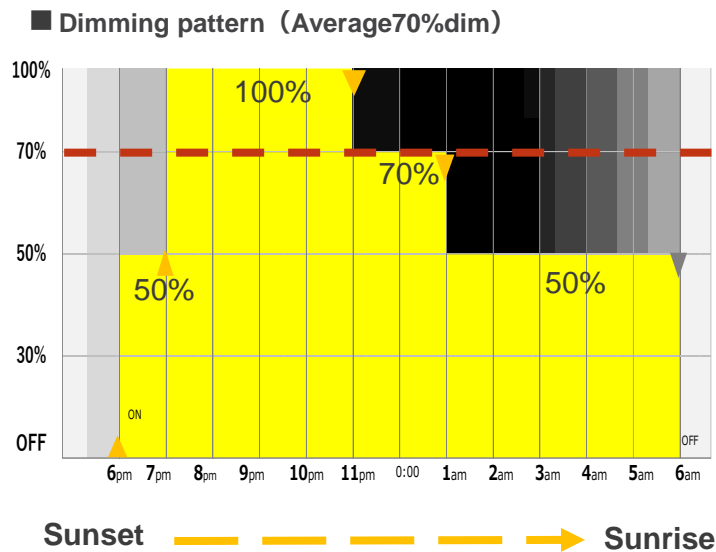


2. Overview of Smart Lighting technology



Excellent energy-saving performance and contribution in CO₂ emission reduction

Our smart LED streetlights can reduce power consumption up to 90% compared to conventional mercury lamps. This is a significant contribution to the reduction of CO₂ emissions.



If 1,000 conventional lamps are replaced by smart lighting (average 70% dimming),

The **annual electricity cost saving** is **26.9 Million Yen** from mercury lamps. 16.8 Million yen cost saving from HPS lamps.

CO₂ emission reduction

- 646 t-CO₂ from Mercury
- 403 t-CO₂ from HPS

※Electricity tariff : 19.25 Yen / kWh

※CO₂ emission factor is 0.462 t-CO₂ / kWh

2. Overview of Smart Lighting technology

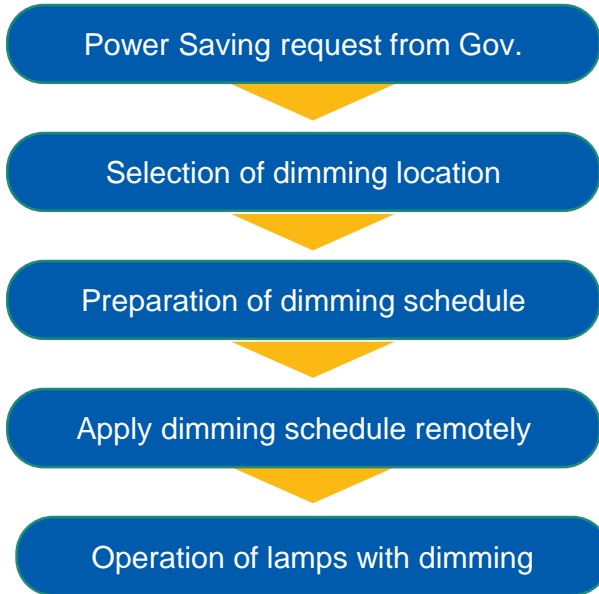
Example of Dimming control: Nasushiobara City, Japan

Our Smart City Solutions has been adopted in Nasushiobara City in Japan. Here, the city is operating smart streetlights to reduce electricity consumption and for effective operation. The city is also moving forward toward smart city by installing multiple sensors to support various solutions.

Quick response to Government request to save electricity

On March 16, 2022, a strong earthquake of M7.4 struck off the coast of Fukushima Prefecture. Japanese government requested local government to reduce power consumption.

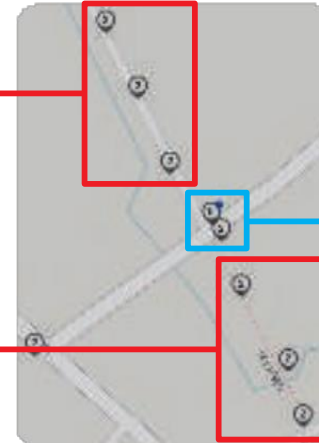
With the smart lighting, Nasushiobara could immediately implement dimming schedule to reduce the power consumption.



■ 50% dimming at the walkway.



■ No dimming at the intersection



■ Dimming level 50%



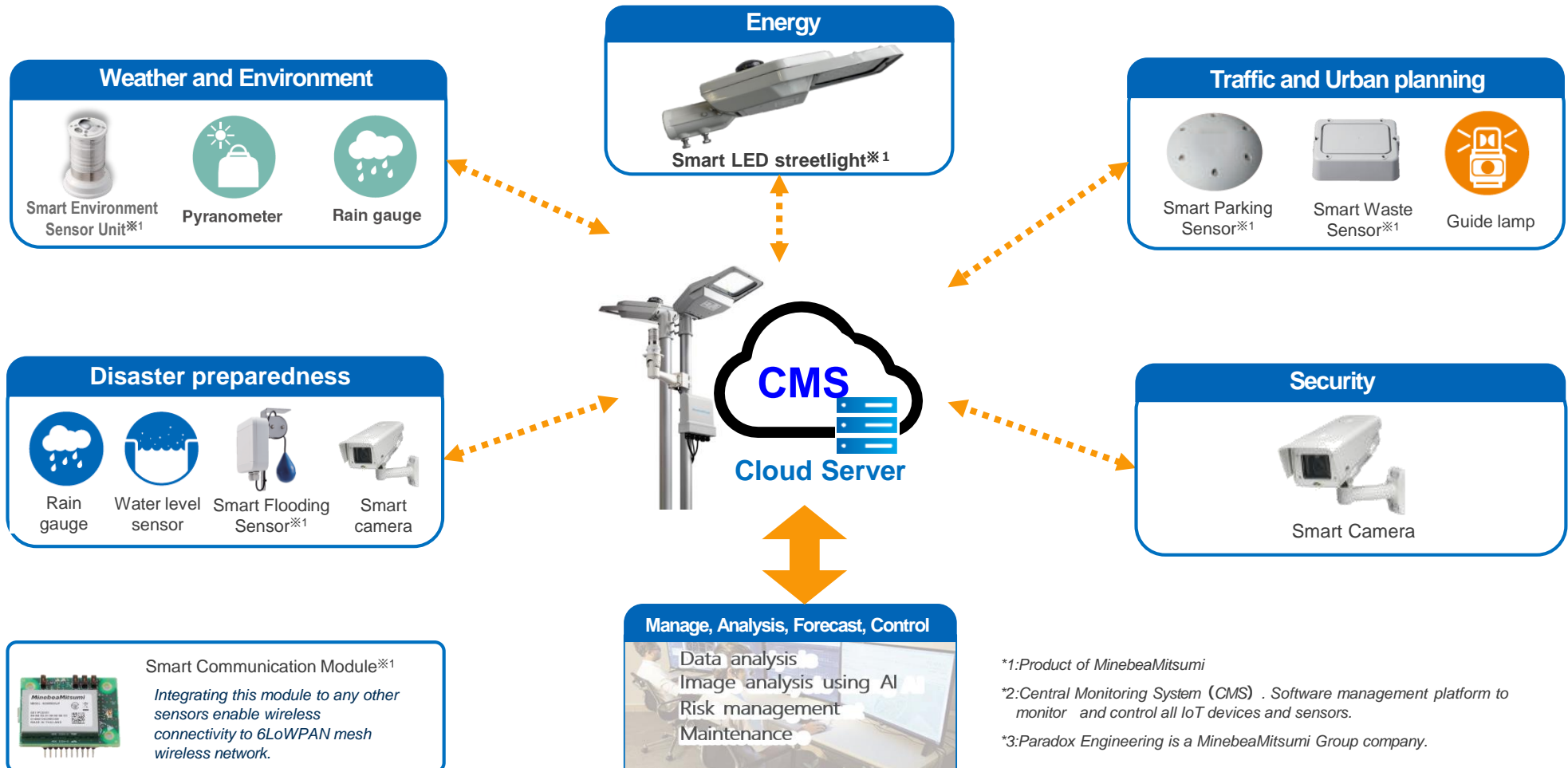
■ Dimming level 100% (no dimming)



2. Overview of Smart Lighting technology

Expandability for Smart, Open Cities

Our wireless network can be expanded by integrating additional sensors and IoT devices. This allows our valued customers to innovate and design new applications of their needs.



*1:Product of MinebeaMitsumi

*2:Central Monitoring System (CMS) . Software management platform to monitor and control all IoT devices and sensors.

*3:Paradox Engineering is a MinebeaMitsumi Group company.

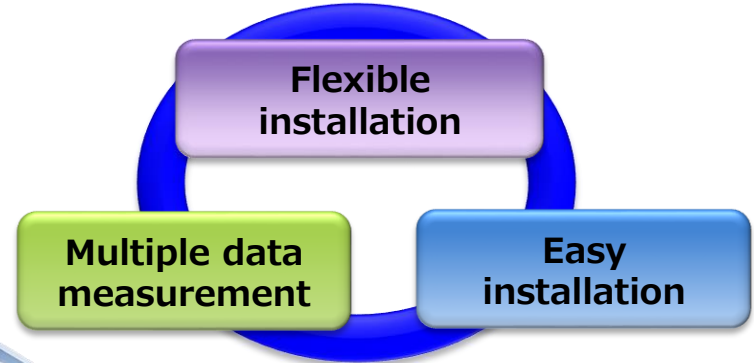
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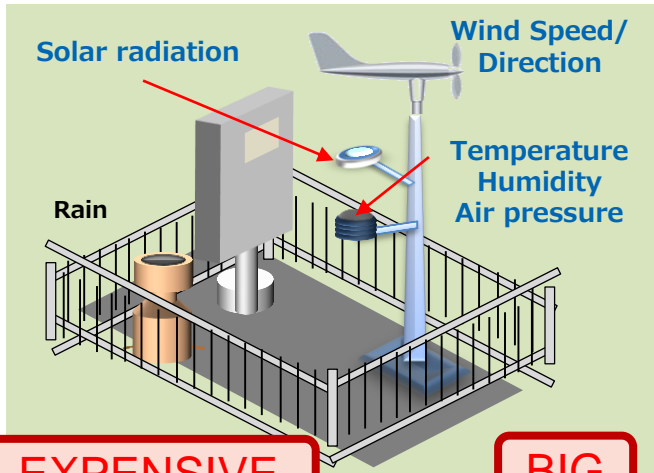
Smart City Solutions by MinebeaMitsumi and use cases

Environment Sensor that can support various weather and environment solutions

"Low price" and "Easy" Environmental measurement

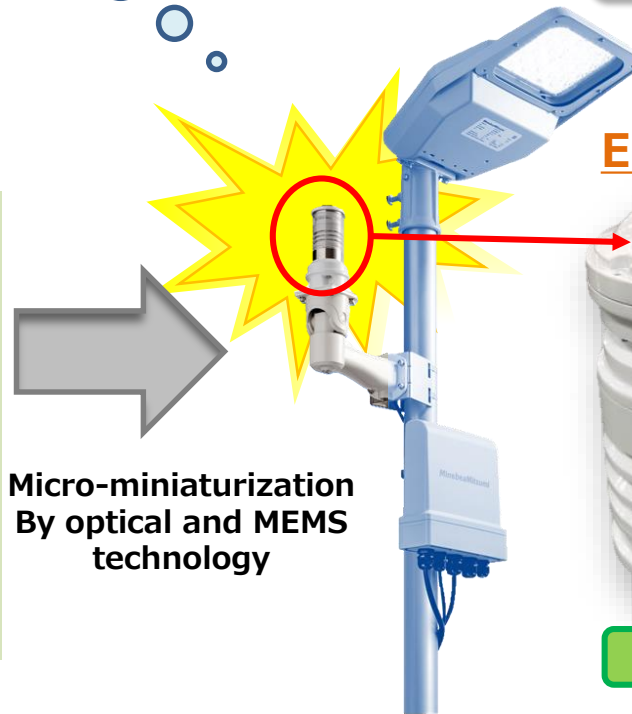


Currently used environmental measurement equipment

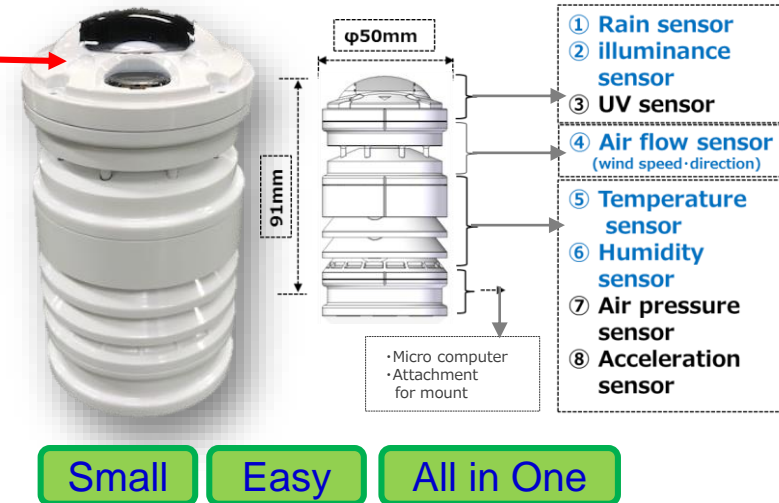


EXPENSIVE

BIG



Environment sensor Unit



3. Smart City Solutions by MinebeaMitsumi

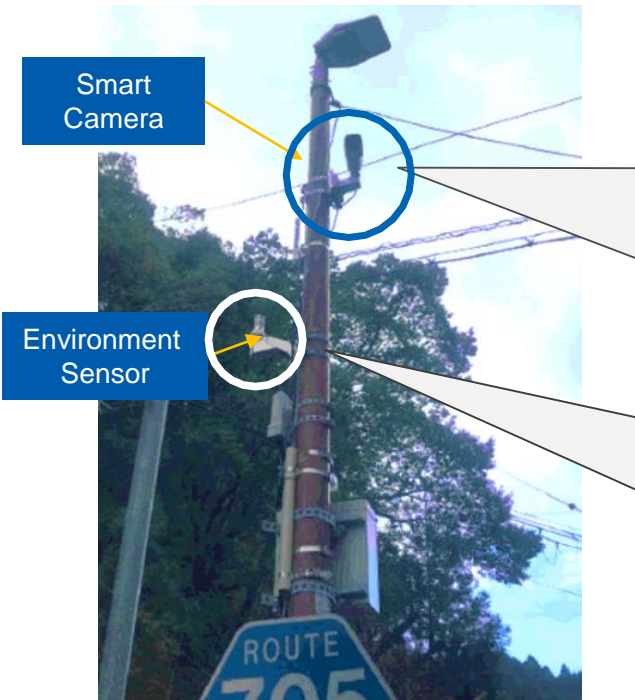
Environment Sensor + Camera

Use case: Monitoring road condition in mountain regions

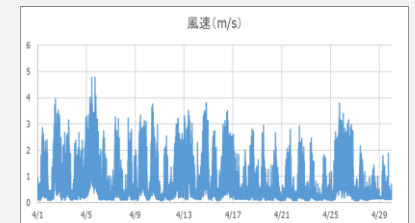
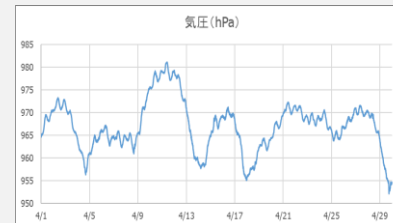
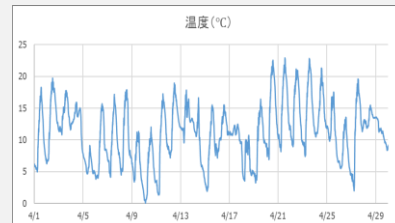
Based on sensor data and camera image, city can check the road condition. If there is “heavy rainfall” or “snowfall” or “road icing”, city can issue alerts to vehicles moving toward those roads or make decision to block traffic for safety and to prevent road accidents.



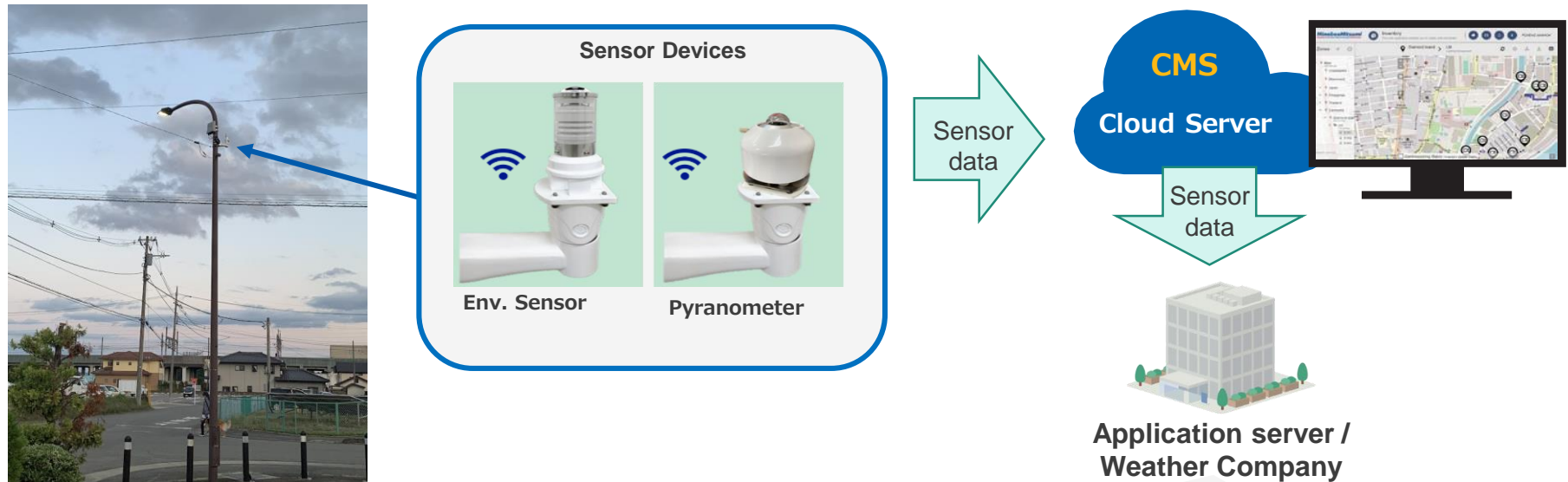
Live monitoring of road status via the installed camera on the streetlight.



- Temperature, • Atmosphere pressure, • Humidity, • Wind speed, • Rainfall, • Illuminance etc.



Environment Sensor + Pyranometer Use cases in Nasushiobara City, Japan



Utilize sensor data

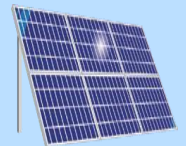
(1) Prevent heat stroke accidents

using environment sensor data by monitoring weather condition city can dispatch alert to residents about the risk.



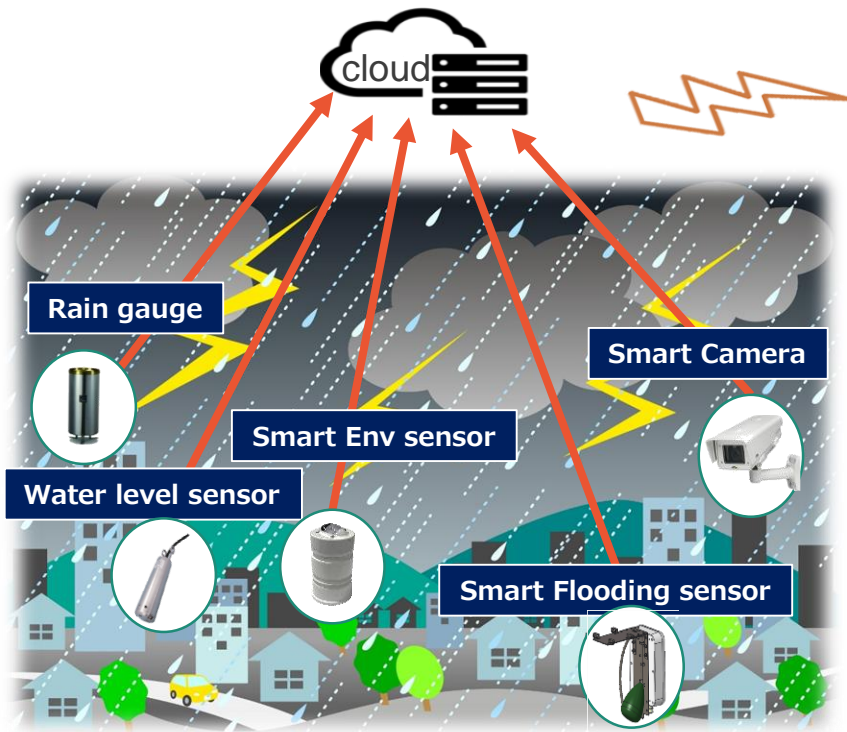
(2) Advance Energy Management

using solar radiation data. by Predicting Solar power generation potential and by efficient energy balance between fossil fuel power generation, contribute in CO₂ emission reduction and energy saving.

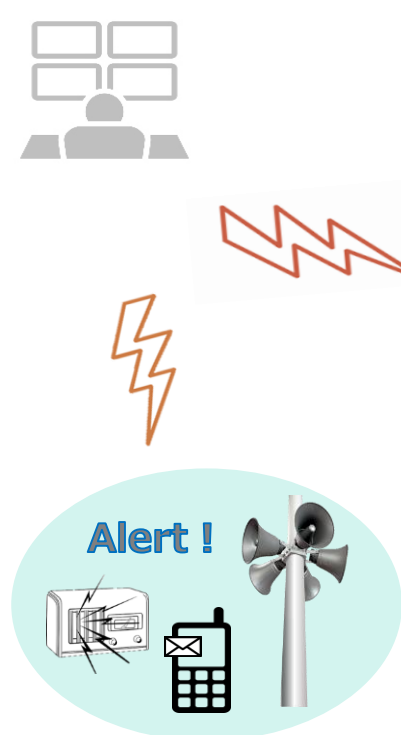


Disaster preparedness:
Install sensors at high-risk zones to check risk level in real time
to detect potential risks in advance.

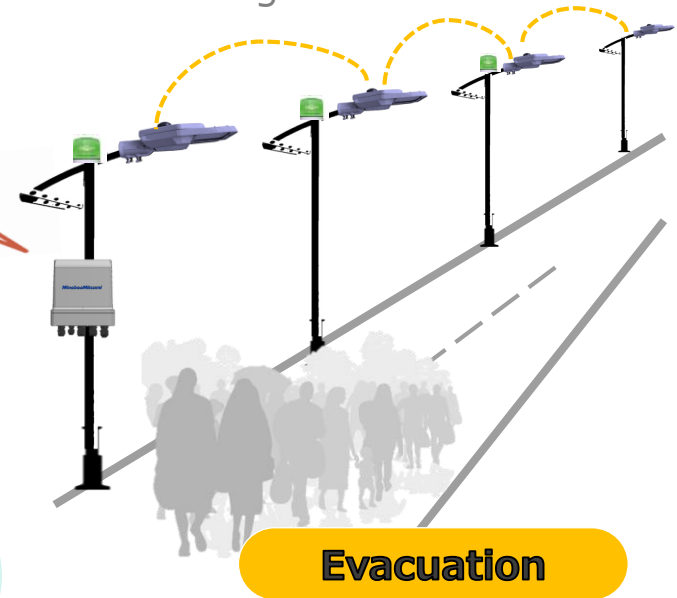
Smart City Solutions



City control center

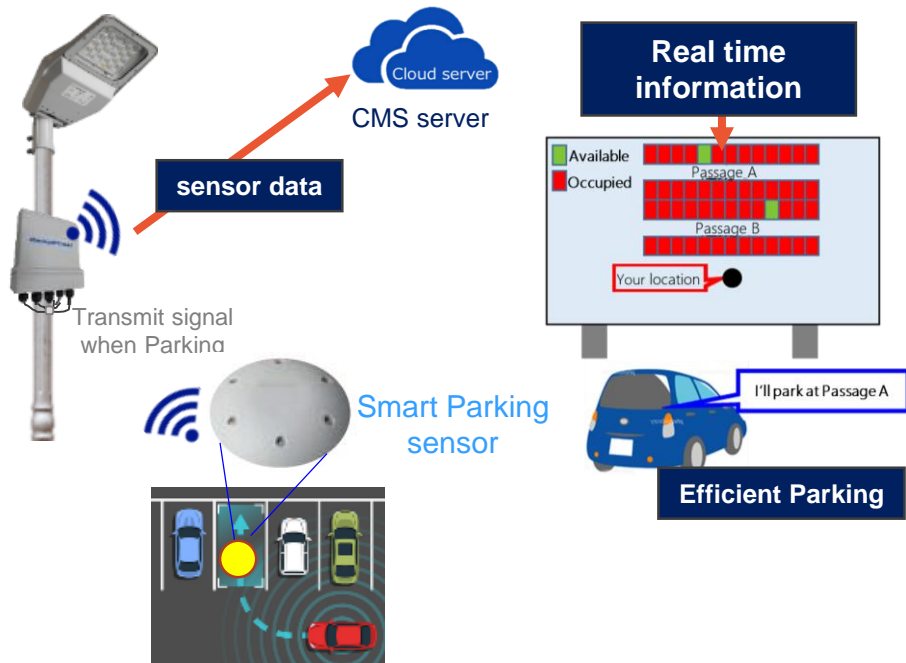


Evacuation guidance !



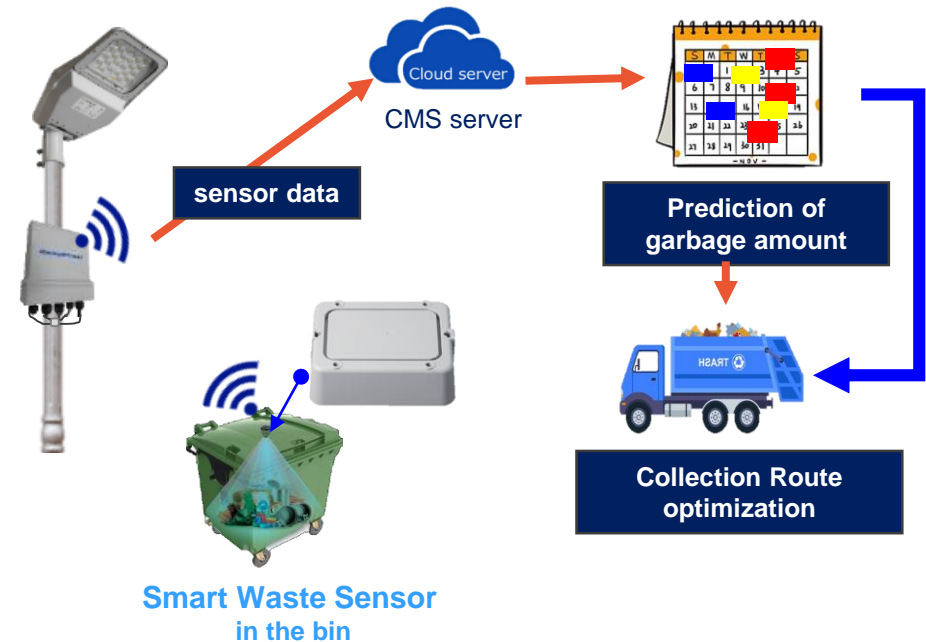
Also it helps to prepare more effective evacuation guidance.

Traffic solution Contribution to smooth parking



- Mitigate traffic congestion by guiding to the facilities with available parking spaces.
- Easy installation of parking sensors.
- By integration camera, can prevent illegal parking.

Waste solution Efficient collection of waste



- Route optimization for waste collection
- Efficient waste collection
- Fuel/gasoline saving

Contribution in creating zero carbon society.

- *Creating energy efficient city*
- *Creating city with disaster management measures and preparedness system*
- *Creating environment friendly city*
- *Creating a city that support convenient life*
- *Creating a safe city that prioritize public security*



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