



# AMANDA

The world in your hands

AutonoMous self powered miniAturized iNtelligent sensor for  
environmental sensing anD asset tracking in smArT IoT environments

## Continuous occupancy monitoring in a parking lot

3<sup>rd</sup> AMANDA Webinar

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## Continuous occupancy monitoring in a parking lot

Parking management solution includes:

- parking lot entrance control
- control and counting parking space occupancy
- payment for parking services
- notification of occupancy
- control of departure from the parking lot



- Penta developed 'SmartEcoParking' - its own integrated indoor and outdoor parking management solution
- Up to 30,000 vehicles pass through Penta-supported car parks daily
- Software and hardware are entirely part of the company's solutions



# Continuous occupancy monitoring in a parking lot

The AMANDA Autonomous Smart Sensing Card Use Cases and associated scenarios

Label	Name	Version	Relation to Use Cases
SC01	Environment and thermal comfort monitoring	Indoor/Outdoor / Wearable	UC1
SC02	Fire detection	Indoor/Outdoor / wearable	
SC03	Continuous occupancy monitoring in a parking lot	Indoor/Outdoor	UC2
SC04	Asset and people localization with access control	Indoor/Outdoor / Wearable	
SC05	Monitor transportation conditions of medicines/vaccines	Indoor/Outdoor / Wearable	UC3
SC06	Crowd counting for social distancing	Indoor/Outdoor	



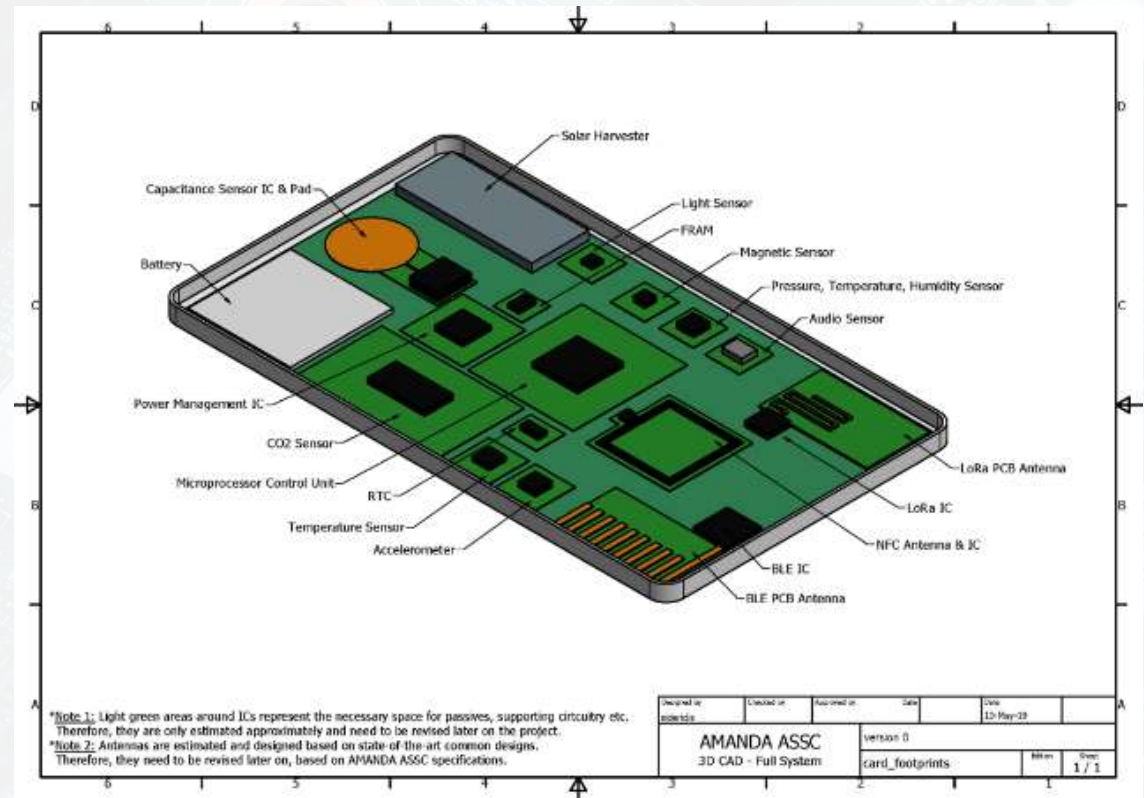
[www.amanda-project.eu](http://www.amanda-project.eu)



# Continuous occupancy monitoring in a parking lot

## AMANDA ASSC sensors:

- Acceleration sensor
- Magnetic sensor
- Light sensor
- Image sensor
- Temperature sensor
- Humidity sensor
- VOC sensor
- CO<sub>2</sub> sensor
- Capacitive sensor

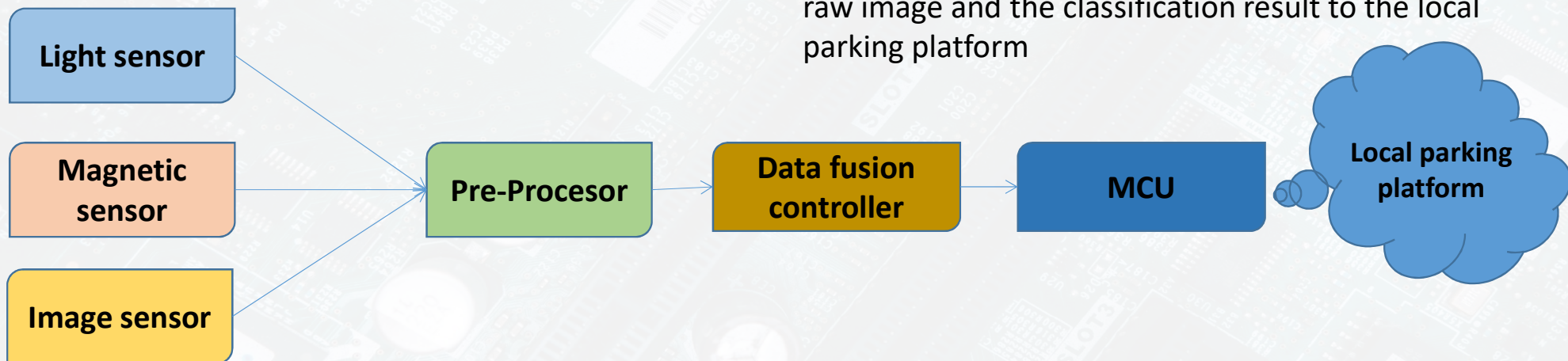


## Continuous occupancy monitoring in a parking lot



**The principle of vehicle detection in the parking lot**

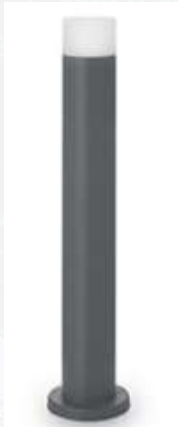
- the ASSC is mounted on the wall, ceiling, parking locks, parking barrier or pole
- the light sensor is always on
- when a threshold is achieved, the magnetometer wakes up to detect a vehicle's presence
- the imaging sensor wakes up, takes an image, vehicle classification (CIFAR10), via BLE or LoRa, sends the raw image and the classification result to the local parking platform





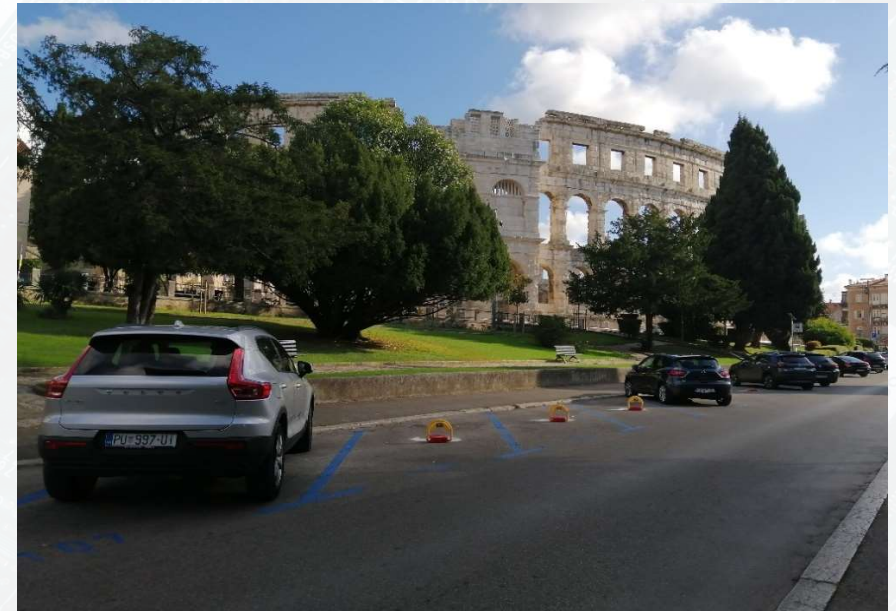
## Continuous occupancy monitoring in a parking lot

### Protection of a private parking spot



#### Running project:

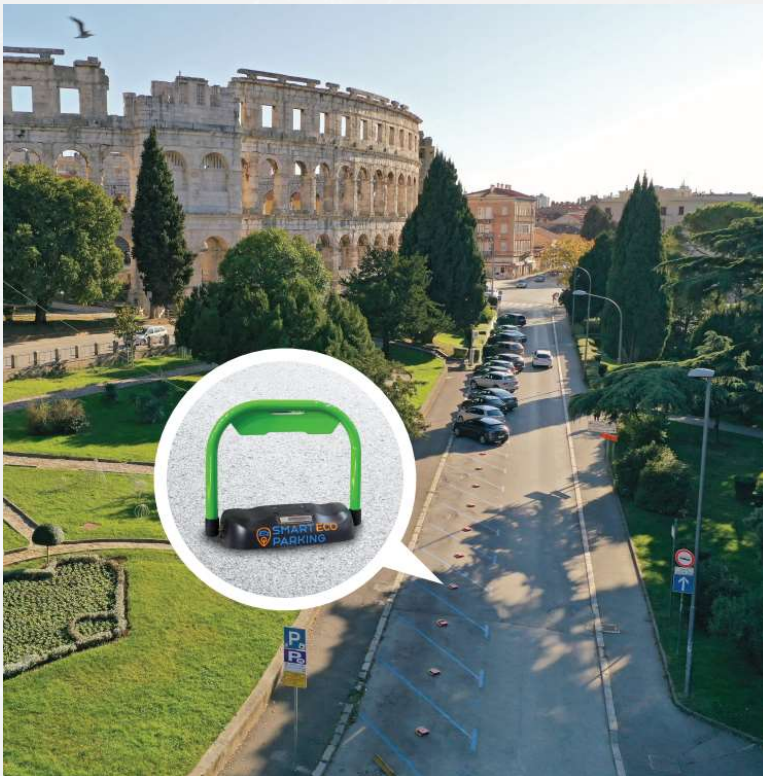
- Provide a private parking space in the open road parking lot
- 60 parking spaces protected by a parking lock
- Sale of parking spots to subscribers
- Reservation parking spot and payment for parking service





## Continuous occupancy monitoring in a parking lot

### Protection of a private parking spot



- The problem of oncoming vehicle detection
- The problem of vehicle identification in front of the parking locks

***Integrated sensors in AMANDA ASSC in symbiosis with data fusion algorithms solve these problems.***





# Continuous occupancy monitoring in a parking lot

Main features and advantages of AMANDA ASSC in continuous occupancy monitoring in a parking lot

- Simple installation (3mm thickness, credit card size)
- autonomous (energy harvester)
- multi-sensing ( more than seven sensors)
- easy integration with other use cases (environmental monitoring, fire detection....)
- low maintenance cost



**AMANDA**  
The world in your hands  
Open your mind for new ideas

**Self-powered intelligent sensing card**

Concept	Impact	Implementation
The project will focus on designing and developing a maintenance-free, miniaturized and easily deployable Autonomous Smart Sensing Card (ASSC) for environmental sensing and asset & people tracking/monitoring in smart living and working environments.	AMANDA stretches the limits of ESS autonomy (in terms of energy, station making, and maintenance-free lifetime extension) and miniaturization with the ultimate goal to develop and successfully validate a cost-effective next generation Autonomous Smart Sensing Card (ASSC) that will serve multi-sensorial IoT applications for smart living and working environments.	The project activities are broken down into 5 WPs and implemented within 36 months (3 years) a duration which is considered appropriate taking into account the time required for the design, development, validation and evolution of the AMANDA device.

www.amanda-project.eu

The consortium:

IMEC, ZH, lightcity, e-peas, ilika, MICROBUL, penta

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## Thank you

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