



ilcs SMART CITY PLATFORM

www.ilcs.it



wireless4 business
www.w4b.com

Index

Welcome in iLCS	3
Smart City project development: the iLCS approach	4
What is the iLCS platform	7
Application modules	8
Smart lighting	11
Environmental analysis	12
AI Traffic & Mobility	13
Parking management	16
Urban lot Automation	17
Metering	18
lot connect	19

Welcome in iLCS

Our urban centres are rapidly transforming into ecosystems of interconnected and interdependent digital organisms. This is the most important change that urban designers have had to face and resolve.

Rapid urbanisation plays a key role in economic and social progress. However, it puts a strain on the urban infrastructure. The main challenges, such as, for example, to name a few, traffic congestion, energy consumption, pollution monitoring, public safety, as well as the construction of sustainable communities, need to be addressed, monitored and improved through the development and implementation of intelligent solutions.

The iLCS solutions (intelligent Light Control System), based on Wi4B technology (www.wi4b.it), allows to manage challenges with a modular approach, starting from the energy savings generated by the adaptive dimming of road LED lights.

Lighting control systems form a pervasive real-time network to capture and process data from a multitude of sensors distributed throughout the territory.

Thus an ecosystem of services is obtained, each economically sustainable, but strengthened by the combination of the others.

Welcome into the **iLCS platform** - www.ilcs.it

Development of Smart City projects: iLCS approach

iLCS, thanks to its numerous technological partnerships, makes possible the optimisation and the management of information from all major urban communication sites, offering wide flexibility and modularity, while at the same time reducing costs through its integrated approach.

The building blocks for intelligent urban areas: communication infrastructure.

Digital transformation has radically altered our habits, both in the private sector and in the time we spend in urban centres. The goal is to improve the quality of life of the inhabitants, thanks to the use of connected and integrated technological solutions, making cities more sustainable, efficient, innovative.

It's a continuous deployment of devices that require different data connections and with different needs: in public transport and mobility in general, in the management and distribution of energy, in public lighting, in urban safety, environmental management and monitoring such as waste management, maintenance and optimisation of public buildings (schools, hospitals, museums, ...).

For this reason the main enabling technologies, which allow the operation of our cities, are the information and communications infrastructures, real highways for the exchange of data necessary for the operation of each service.

iLCS offers a **modular approach with a multi level architecture**, which allows to use the best of each layer, with an integrated data management and processing.

The architecture integrates a number of **sensors and third-party triggers for process automation** in public space and industrial areas.

That's the reason of iLCS Platform, a distributed platform with excellent performance for **real-time monitoring and control of the environment** (both urban and industrial), maximizing the added value of the IoT.

The wide choice of sensors and industrial partners, using different wireless technologies for the acquisition of data from the environment and for its control, allows to offer wide flexibility and modularity, at the same time reducing costs thanks to the integrated approach.

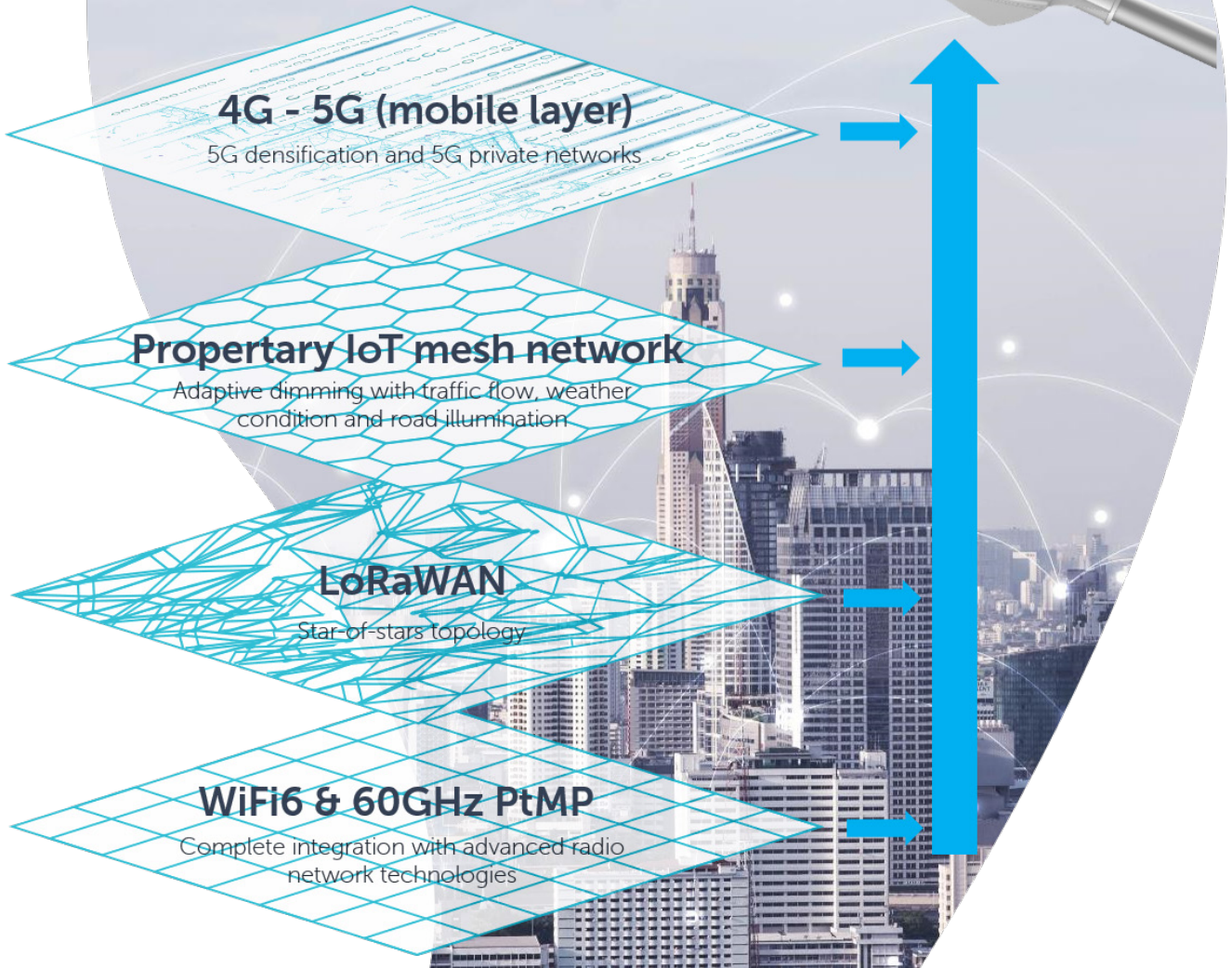
iLCS uses the most innovative communication technologies with a layered approach, as shown in the image.

Can be considered as the first step necessary for the improvement, extension and optimization of information management in the city.

For more information, contact us:
www.ilcs.it.



Edge computing for machine learning and analytics in a cyber secured platform



Cyber security and communications and information security

iLCS is an integrated architecture to provide globally protected communication networks and data streams for secure IoT monitoring in urban and industrial environments.

The iLCS architecture has been developed with particular attention to the cyber security aspects necessary for its protection.

Important investments have been dedicated to the design of a modular architecture, protected in its infrastructure thanks to **encryption**

in the communications from each device, the safeguarding of encryption data with appropriate **hardware chips**, the evaluation of potential attacks during the operations.

The security of the iLCS architecture derives from having followed and implemented the main best practices in terms of cyber security during the design and implementation phase.

The following design principles have been followed and are currently being followed throughout the development, using suggested best practices:

- Data integrity (static and dynam-

ic).

- Access monitoring on the various logical sections of the platform.
- Evaluation and defense from externally generated attacks.
- Assessment and defense against internally generated attacks.
- Assessment and defense against supply chain-oriented attacks.
- Access control monitored in each section.

The cyber security aspects are also developed thanks to the collaboration with Israeli partners with whom Wi4b collaborates constantly.

What is iLCS platform

The iLCS platform is a software platform for managing data in real time, integrating the IoT infrastructure, allowing it to function and collecting and distributing the acquired data for their use by a multitude of third-party applications.

Features

- Platform for managing data flows in real time.
- Integration of any data source from existing and future systems.
- Open communication protocols.
- Generate complete data streams from connecting existing systems to the final application.
- Possibility of integrating IoT devices for the collection and analysis of urban data.
- Integration service with existing systems and evaluation of their modification for improved functionalities.

Functionality

- Real-time data collection from existing systems and IoT devices.
- Supply of raw or already integrated data (data fusion) for users and processing systems.
- Visualization and processing of data, for example in the form of maps and dashboards.
- Data security and attack protection.
- Raw data analysis and their harmonization.
- Calculation of real-time forecasts ("intelligent data") based on incoming data
- Event data and "raw data": fast data analysis.
- Calculation of models based on historical data - Big Data Analysis.

Extensions

- Provide a development environment for data processing and event-based actions.
- Complex artificial intelligence models based on available data.
- Deep Learning and computer vision frameworks for extracting data in real time from video streams.
- Customizable and verticalized dashboards for the user and / or for the service.



Application modules

The iLCS platform includes several application modules, each designed and developed with the aim of making the acquisition, processing and display of data in real time from the territory intuitive.



Smart Lighting

It allows advanced management of lighting systems through the use of sensors on board of each lamp to be managed.

The module uses the real-time traffic data of the evaluated roads to adapt the lighting to the corresponding road category (adaptive regulation).

It is possible to monitor the system in real time, having greater awareness and receiving alerts on malfunctions and customizable reports. The municipality reduces energy costs by increasing safety with adaptive lighting.

Citizens benefit from the "reduction of light pollution" by improving the situation of street lighting.

The innovative system is based on a network of wireless sensors installed on the street lamps, which provide adaptive lighting and create a real telecommunications infrastructure. In this way, street lighting can be understood as an "integrated digital hub" in which the light pole can enable additional functions through additional sensors.

Environmental analysis

The module is the basis of each municipality to acquire awareness of the green transformation.

Data can be obtained on the improvement of CO2 emissions as a function of the Smart City services analysed, providing objective parameters and evolutionary trends that make it possible to evaluate any strategies undertaken to achieve "carbon neutrality".

It is further possible to acquire and evaluate data from control units for the analysis of air quality and meteorological conditions.

The control units can be analogue / digital, and transmit data in wired or wireless mode, using various technologies (3G, LoRa, 802.15.4, Wi-Fi).

Traffic and mobility

It allows the extraction of data in real time from the video streams present in the city, using AI modules on the edge.

Data mining is a challenging task that becomes even more complex in growing environments such as cities.

iLCS believes in the power of on-edge Computer Vision to solve costly data mining tasks. The AI Traffic & Mobility module creates the link between the physical world and information in real time.

Everything is enabled, from the counting and classification of traffic, to the analysis of pedestrian crossing times and the management of parking lots.

Through perfect integration and simple modular installation, the module becomes the intelligent eye of YOUR Smart City!

Parking management

The parking management module allows to acquire information in real time from a multitude of sensors for evaluating the status of parking lots. Algorithm-based sensors that use magnetic field combined with radar technology can be used. It is also possible to use IP cameras, even already installed, to extract the status of the parking lots and the type of vehicle parked using Computer Vision algorithms.

The module provides traceable, data-driven parking monitoring that simplifies processes. You can integrate real-time data into third-party applications and thus control parking areas more efficiently.

Urban IoT automation

It allows the creation of geographically distributed automations, acquiring the input data from the sensors present in the environment, and activating the actuators that allow the devices to act on the basis of the data of their sensors and the feedback of the implemented algorithms.

The main thrust for IoT automation is to significantly reduce operating costs as sensors and actuators become devices that communicate with each other in a real-time platform without human intervention. It's the next big leap in productivity because there are great benefits that

come from acquiring and organizing previously unthinkable quantity and quality of data.

Meetering

It allows to have awareness of consumption and better accuracy in identifying anomalies.

The Metering module is our integral solution dedicated to measuring, analysing and optimizing energy consumption of electricity, water or gas, among others.

Oriented to provide services to companies that need the infrastructure to manage the acquisition and processing of data, as well as the management of the assets involved, centralized in a single platform.

Smart meters offer immediate benefits to the end user, such as more accurate and potentially lower ratios, thanks to greater awareness of what is happening.

But it should not be overlooked that their capillarity becomes precious for collecting and sharing data on a large scale, tracing the way towards strategic decisions based on more precise data.

IoT connection

IoT Connect is a module that allows you to connect wireless devices that use the various protocols available, such as:

- Low-power, long-range LoRaWAN (Wide Area Network).
- IEEE802.15.4
- NBIoT
- 802.11
- 5G

Using the IoT connect module, it is possible to connect your devices to the cloud without developing or using an intermediate network server (NS).

An open and intelligent infrastructure and integrated management are essential to create a city environment capable of competing effectively, making the best use of citizens' resources.



Smart lighting

The advanced technologies adopted in the intelligent lighting service are able to dynamically adapt the light intensity according to actual needs, generating significant additional energy savings compared to just replacing the LED.

The iLCS platform is the most advanced light management platform that combines the advantages of a modern remote control system with the exceptional possibilities deriving from the use of the real time wireless communication network and an **advanced IoT cloud platform**.

The most interesting function for a massive energy saving is the possibility to adjust the light intensity according to the actual needs, for example by **lowering the light when**

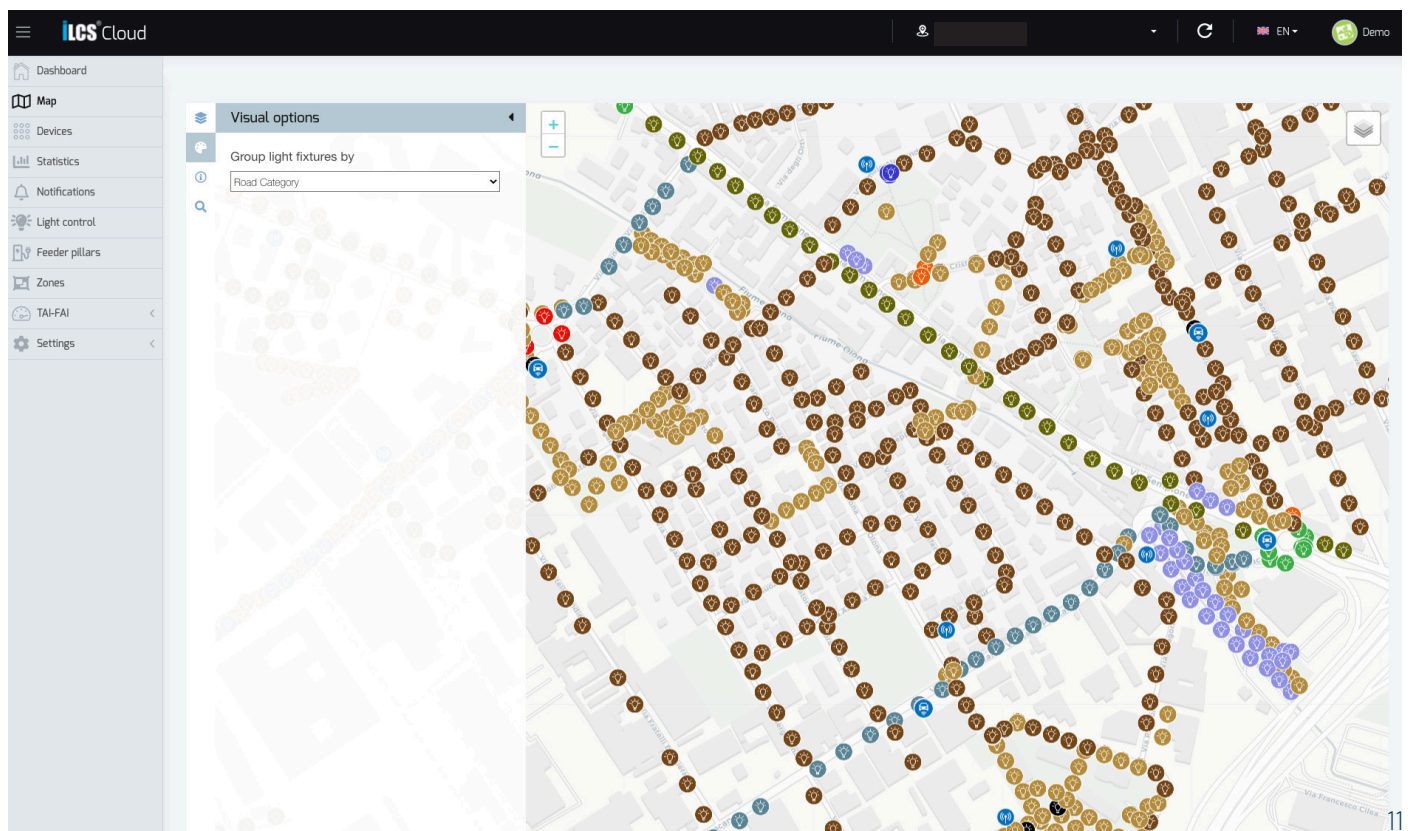
low volumes of traffic are detected in combination with good visibility conditions, in compliance with the national or regional regulations.

For example, using the **FAI (Full Adaptive Installation) algorithm**, it is possible to generate significant savings thanks to dynamic dimming, linked to road traffic conditions and weather conditions.

Each street is generally assigned to a specific lighting category that de-

pends on the expected traffic flow. However, according to the UNI 11248 standard, the lighting category can be dynamically modified on the basis of real-time measurements of real traffic and weather conditions.

In this way, significant savings are achieved which justify intelligent lighting systems as additional sources of savings in the transition to LED.



Environmental analysis

The platform offers an excellent tool for a detailed analysis of the air and the real points of interest.

The quality of the urban environment directly affects people's health and it is important to understand the real-time status of urban air quality.

The **monitoring of air quality**, the analysis of data on the concentration of atmospheric pollutants and the **space-time visualization** are the strengths of the platform.

Using real-time monitoring data, with detection points down to the granularity of the minute, the iLCS

platform enables interactive queries and makes it easier for users to assess the trend of pollutants.

Air pollution with PM2.5 (particulate matter less than 2.5 micrometers in diameter) is a serious health risk in many cities around the world, but because measuring instruments are traditionally expensive, monitoring sites are rare and generally they show only background concentrations.

With the advent of low-cost, radio

connected sensors, air quality measurements are increasingly being made in places where many people spend their time and pollution is worst: on streets near traffic.

Their **ease of installation and low cost** make it possible to have data which, although less precise, are an important source for understanding the space-time trends of pollutants.



Statistics





AI Traffic & Mobility

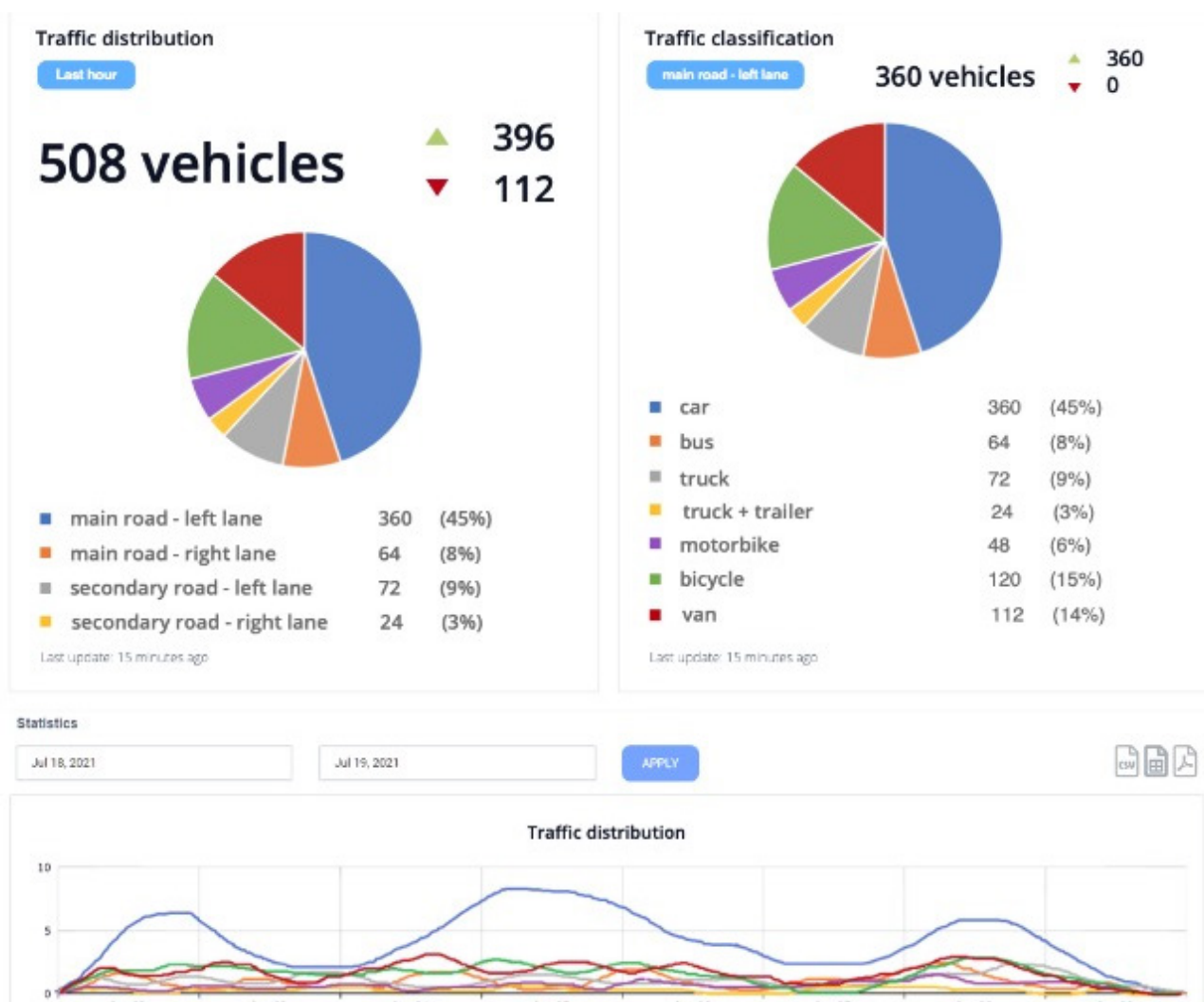
The Computer Vision module allows the extraction of data in real time from the video streams present in the city, using AI modules on the edge.

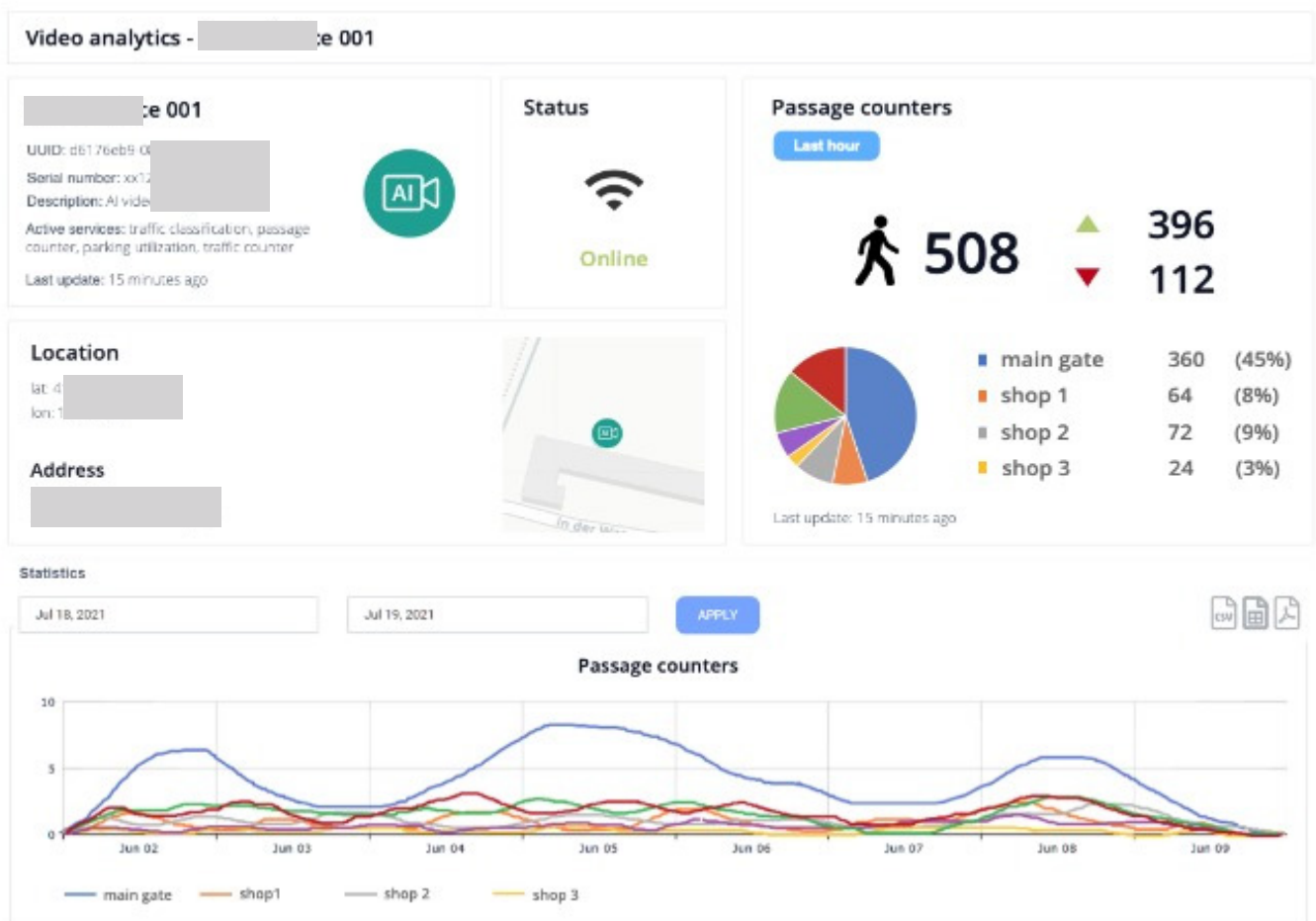
The increase of cameras installed in cities has made it possible to help very often to solve safety problems or congestion in the streets. However, video streams are under-used due to the amount of information that can be extracted,

processed in real time and made available as aggregated data, for easy processing.

The AI Traffic & Mobility module was designed to increase and improve the use of IP cameras in the munic-

ipal area, allowing them to evolve from simple recording tools to advanced sensors for analysing the surrounding environment, providing previously inaccessible information and opening up to new potential services.





The system can be configured to manage the count of people entering and exiting places of interest such as squares or historic centers. The system can also be used to study the statistical trends of pedestrian flows.

Accurate information can be obtained in the counting of pedestrians or cyclists, being able to analyse in detail the trend of historic centers during periods of closure to traffic, optimizing the people flow to vehicles and studying the trend in the use of neighbouring parking lots.

The applications for its use are several, and they are totally configurable.

For example, traffic can be classified into 7 categories (cars, buses, trucks, trucks with trailers, motorcycles, bi-

cycles, pedestrians) by defining one or more gates in the area framed by the camera.

Faced with a complex road situation therefore useful for a more detailed analysis, such as an intersection, more areas can be defined, and each analysis area can provide independent and useful information for a better profiling of traffic as a whole.

The AI module adds sense to surveillance by automatically analysing and extracting meaningful information from huge amounts of digital streaming data.

Based on a rich and constantly updated set of Computer Vision-based video analytics engines, the module has already been used successfully in several security and surveillance applications, including traffic, crowd,

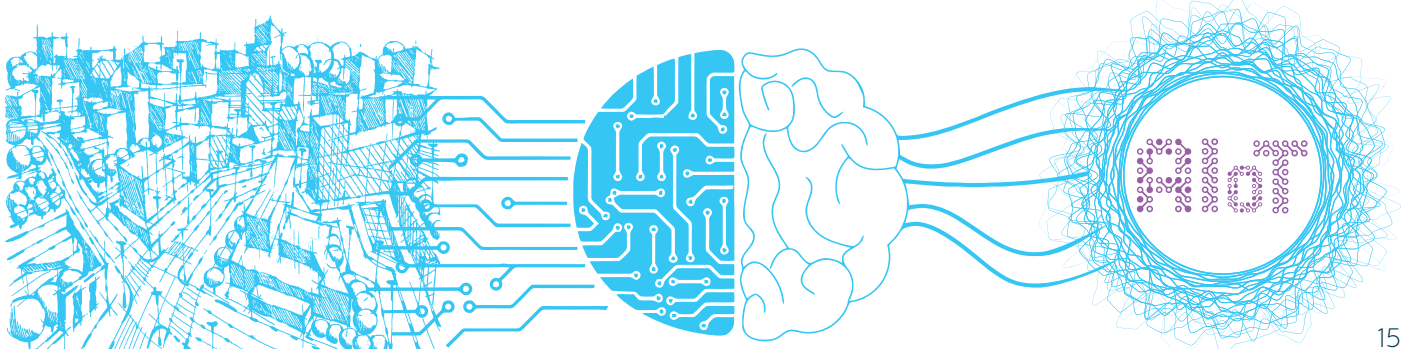
parking, building management such as the count of people entering / exiting.

The introduction of a Deep Learning (DL) framework also allow to enable many new applications.

The AI Traffic & Mobility module has been specially designed to replace the tedious manual processes used to track, regulate and analyse the movement of vehicles on the roads and to enforce traffic rules.

It acts as a true decision support system for traffic planners and law enforcement.

The system is highly scalable as it allows video processing to be performed even on the edge, distributing the processing load and allowing the architecture to scale easily without resource limits.



Parking management

The platform offers a real-time view of events, provides all statistical data to acquire information on behaviours and trends.

It also allows to know the type of vehicle parked in each spot.

Designed to monitor and manage large public and private car parks, the platform allows to easily integrate third-party hardware products, thus benefiting from the strengths of each technology.

For this reason it is possible to use a multitude of technologies available for parking detection:

- Sensors to be installed on the ground.
- Optical detection sensors.
- IP cameras.
- Magnetic and / or radar sensors.

Each technology has its own strengths, and their joint use allows you to customize the project in the best way, depending on the individual areas to be monitored.

An advanced function that the Parking Management module provides concerns the possibility of receiving information also relating to the type of vehicle parked.

The advanced functions allow for example to more effectively monitor the use of electric vehicle charging

stations.

iLCS Cloud allows you to view all installations associated with the user in one place. Moving between them takes just one click.

The car parks are georeferenced and displayed on the main dashboard, allowing for easy location, and are intuitively coloured according to their actual occupancy status.



Urban IoT automation

It allows to connect, manage, process and analyse data from thousands of IoT devices and sensors from heterogeneous networks, activating triggers and outputs in real time, in geographically distributed environments.

One of the most distinctive features of a smart city is its ability to assimilate new technologies. But what do we mean by smart city technology? No, it is not a list of devices "that facilitate urban life".

Self-driving cars, Big Data, robots, remote public services... reveal the level of urban intelligence on the surface.

However, their integration is based on a more complex equation.

To solve this problem, it is important to note that these smart city solutions are closely related and gener-

ate effects on many levels.

Interoperability and data integration are two of the most challenging problems facing cities today.

Very often it is not possible to effectively exploit this information due to the huge amount of data generated, the heterogeneity of the data and the lack of a common platform for their integrated analysis.

The Urban IoT automation module realizes a complete data fusion, allowing you to connect, manage, process and analyse the data of thousands of IoT devices and sen-

sors of heterogeneous networks. It also allows you to:

- Collect data from thousands of IoT devices,
- Normalize the integration of IoT devices,
- Big data analysis in real time on flows and events.
- Run custom machine learning algorithms.
- Free real-time triggers and outputs, obtained from the implemented algorithms.



Meetering

Monitoring and management of multi-utility infrastructures (water, gas, electricity and others), connecting, managing and processing data from smart meters, in geographically distributed environments.

The Metering module is our integral solution dedicated to measuring, analysing and optimizing consumption of electricity, water or gas, among others.

Oriented to provide services to companies that need the infrastructure to manage the acquisition and processing of data, as well as the management of the assets involved centralized in a single platform.

The tools provided allow to analyse and optimize the efficiency of the monitored infrastructure. The Metering module can be implemented in residential, industrial or commercial environments to also carry out sub-accounting activities, which make it possible to reduce costs by optimizing consumption.

Some of its strengths:

- Device integration: multi-protocol and multi-utility.
- Data collection and processing to build a unified data model.
- Personalized reports.
- Customizable tools and dashboards for data visualization.
- M2M and API integration to be integrated also with external systems.
- Advanced data processing tools for the implementation of new ad hoc algorithms, aggregations, analyses, etc.
- Positioning management (geo-

location).

- Automated rules and customizable alarms.
- Operational status monitoring.

Smart Meters and other collection devices communicate with the Metering module in a safe, efficient and economical way, using modern communication technologies. Our system is independent of communication technology, so wireless communications of any kind are available while monitoring and management tools enrich the information collected.

The Metering module is part of the iLCS IoT platform and therefore leverage the complete set of tools to remotely monitor, manage and operate with resources and devices. It allows you to integrate many types of smart meters, and allows to have real-time information on consumption, through two-way communication for accurate analysis.

Smart metering allows you to track points of loss and inefficient or unauthorized use of networks.

It offers the ability to have shorter downtime, as well as long-term benefits such as trade loss tracking and improved operational efficiency. Furthermore, the optimization of the network leads to its stability and expansion at reduced costs.

Smart meters offer the ability to know more precisely how much energy is being used and how it could be used more efficiently through detailed feedback.

By analysing large-scale data, we can move to a model in which granular, real-time demand data, rather than historical data, determines supply generation. This will support the shift from large-scale planning to more local and efficient planning.

IoT connect

Wireless transport infrastructures for IoT devices, in the various protocols available on the market, such as: LoRaWAN, IEEE802.15.4, NBIoT, 802.11, 5G.

Your devices can be connected to the Cloud without developing or using an intermediate network server.

The iLCS team can support you with a full range of network infrastructure solutions that solve critical problems in the design, construction, installation, commissioning and operation of wireless networks.

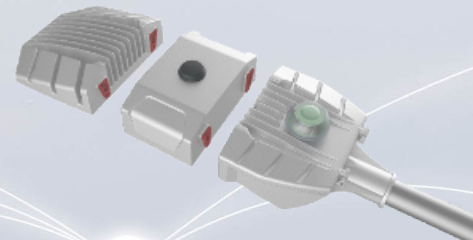
The offered design is based on:

- Simplicity: ease of implementation and maintenance
- Efficiency: operate reliably and scalable to reduce costs.
- Capacity: increase capacity quickly and inexpensively as needs grow.
- Performance: offer an optimal user experience to increase customer satisfaction and con-

sequently revenues.

We build strong partnerships, our customers know they can count on us to modernize their network infrastructure.

iLCS supports you to offer you a complete end-to-end RF solution, everything you need to build complete, high-performance networks.





2018

Best innovative product - Middle east
Lighting design summit 2018 (Dubai)

2018

Best innovative product - Australian
smart lighting summit

2019

Top5 in category "smart city" at Handel-
sblatt Energy awards 19/20 (Germany)

2020

European product design award

ilcs[®]
Intelligent Light Control System

 **wirelessforbusiness**
www.wi4b.com

2021_06

www.ilcs.it