FIWARE: Driving Smart Cities through Mobility

Smart MaaS
- a Modular Mobility Service Platform

Smart Mobility as a Service (MaaS) is building an open platform and a reference topology for integrated mobility in cities and regions. It will be the basis for scalable MaaS accessible anywhere in the world.
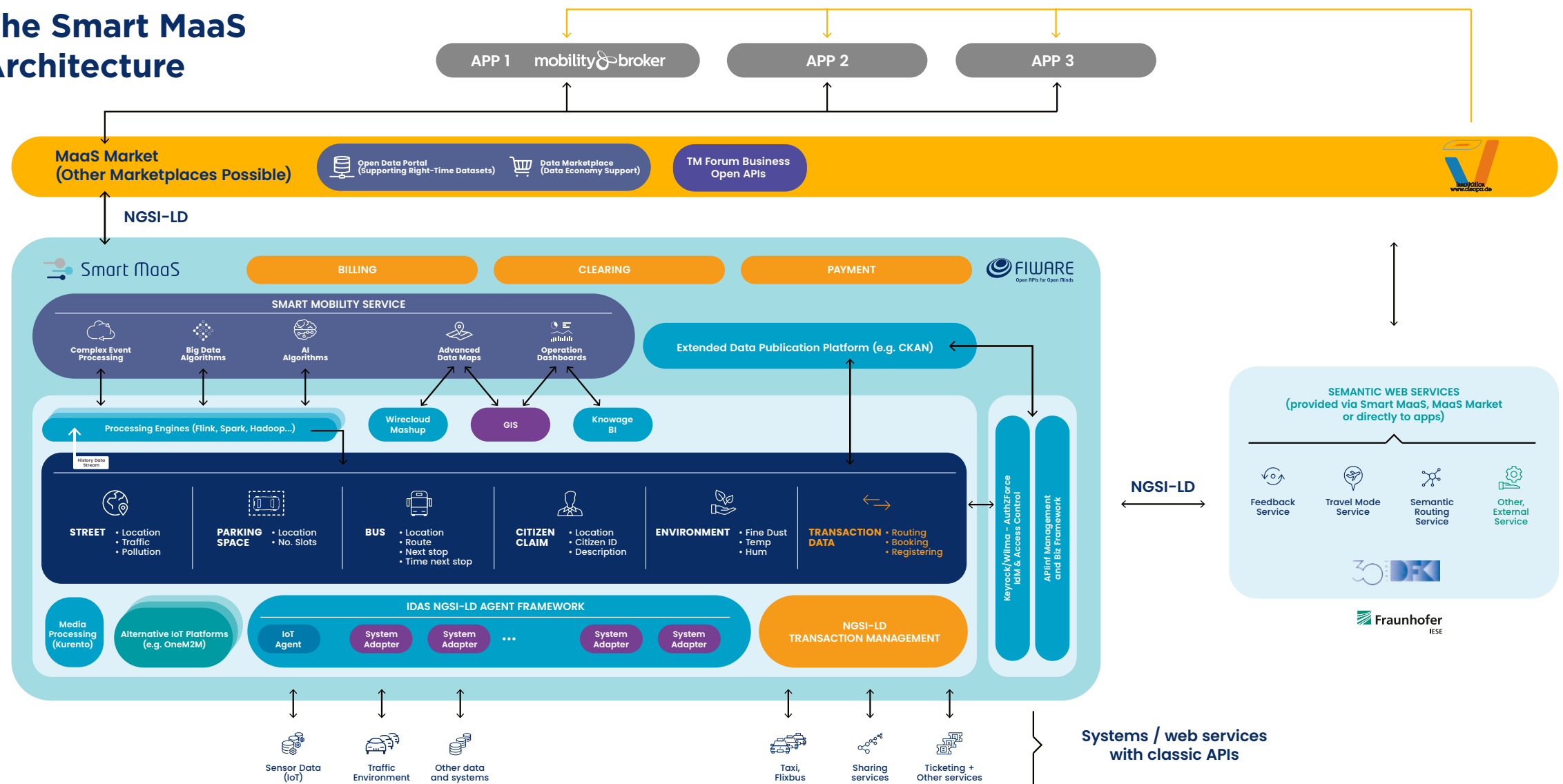
Today, there are already comprehensive solutions or applications that integrate several different modes of transport. However, if a user changes transport network, a specific application either does not work at all or only with limited functionality. This fragmentation is exacerbated by the foreseeable developments in the areas of the **Internet of Things (IoT), Smart City, electromobility** and **autonomous transport systems**, which also implement their own IoT platforms and solutions for their functionalities and which must be brought together for comprehensive mobility applications.

The project is driven by a strong focus on the actual needs of cities, communities and regions as well as new and established transport operators. Important goals are the opening up, interoperability and utilization of existing and innovative mobility services and their availability within the context of an integrated, standardized **Smart Mobility / Smart City** service platform. Smart MaaS is being built on the **standardized web and domain-neutral FIWARE technologies**. The platform will connect and monetize different mobility services, following a marketplace model.

One of the central Smart MaaS elements is the implementation and promotion of the new **ETSI NGSI-LD** ("Next Generation Service Interface - Linked Data") standard. The unique value proposition lies in the machine-readable, semantic data descriptions which help developers to find even unknown services, to research the data and functions provided and integrate them into their own applications - and thus make a significant contribution to harmonizing the smart mobility sector.

FIWARE reference architectures and technologies have been widely and successfully adopted for implementations in various domains across the globe, Smart MaaS is extending this collection to Smart Mobility integrated in Smart Cities. FIWARE is hereby driving standardization activities to extend its outreach. **FIWARE Context Broker technology** has been announced as a new **CEF** (Connecting Europe Facility) Building Block and **ETSI NGSI-LD** has been published as the new ETSI ISG CIM standard for **Context Information Management.**

FIWARE

The Smart MaaS Architecture

APP 1 — mobility&broker APP 2 APP 3

MaaS Market (Other Marketplaces Possible)
- Open Data Portal (Supporting Right-Time Datasets)
- Data Marketplace (Data Economy Support)
- TM Forum Business Open APIs

NGSI-LD

Smart MaaS — BILLING — CLEARING — PAYMENT — FIWARE (Open APIs for Open Minds)

SMART MOBILITY SERVICE
- Complex Event Processing
- Big Data Algorithms
- AI Algorithms
- Advanced Data Maps
- Operation Dashboards

Extended Data Publication Platform (e.g. CKAN)

Processing Engines (Flink, Spark, Hadoop...)
- Wirecloud Mashup
- GIS
- Knowage BI

History Data Stream

STREET	PARKING SPACE	BUS	CITIZEN CLAIM	ENVIRONMENT	TRANSACTION DATA
• Location • Traffic • Pollution	• Location • No. Slots	• Location • Route • Next stop • Time next stop	• Location • Citizen ID • Description	• Fine Dust • Temp • Hum	• Routing • Booking • Registering

IDAS NGSI-LD AGENT FRAMEWORK
- Media Processing (Kurento)
- Alternative IoT Platforms (e.g. OneM2M)
- IoT Agent
- System Adapter
- System Adapter … System Adapter System Adapter
- NGSI-LD TRANSACTION MANAGEMENT

Keyrock/Wilma – AuthZForce IdM & Access Control
APInf Management and Biz Framework

NGSI-LD

SEMANTIC WEB SERVICES (provided via Smart MaaS, MaaS Market or directly to apps)
- Feedback Service
- Travel Mode Service
- Semantic Routing Service
- Other, External Service

DFKI Fraunhofer IESE

Sensor Data (IoT) — Traffic Environment — Other data and systems — Taxi, Flixbus — Sharing services — Ticketing + Other services

Systems / web services with classic APIs
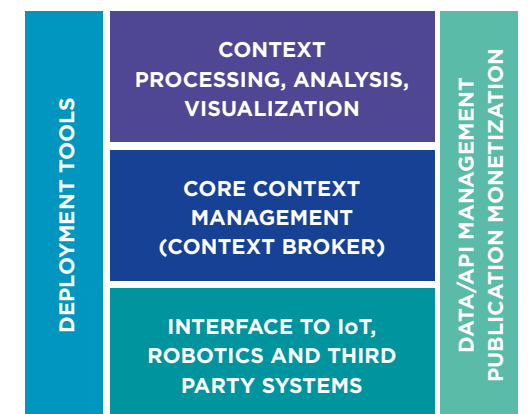
THE FIWARE TECHNOLOGIES

In any Smart Solution there is a need to gather and manage context information, processing that information and informing external actors, enabling them to actuate and therefore alter or enrich the current context. FIWARE is a curated framework of open source platform components to access and manage heterogeneous context information through open APIs. Its own software components - **Generic Enablers**, can be easily assembled together with other third-party components to accelerate the development of Smart Solutions. The FIWARE technologies define a universal set of standards for context data management applicable in different domains such as Smart Cities, Smart Industry, Smart Agrifood, and Smart Energy. Various areas of the Smart City can benefit from the FIWARE technologies: from mobility, parking, lighting and air pollution monitoring to buildings, security, and tourism.

FIWARE provides a rather simple yet powerful set of APIs and also combines components enabling the connection to the **IoT** with **Context Information Management** and **Big Data** services on the **Cloud**. Being open source and providing open data models, FIWARE-based solutions are avoiding vendor lock-in.

Built around the main FIWARE Generic Enabler - the **Context Broker**, a rich suite of complementary FIWARE components are available, dealing with:

· Interfacing with the Internet of Things (**IoT**), **Robots** and third-party systems

· **Context Data/API management**, publication and monetization

· Processing, analysis and visualization of context information

In addition, the FIWARE platform brings a number of deployment tools easing the deployment and configuration of FIWARE or third-party components and their integration with FIWARE Context Broker technology.

DEPLOYMENT TOOLS

CONTEXT PROCESSING, ANALYSIS, VISUALIZATION

CORE CONTEXT MANAGEMENT (CONTEXT BROKER)

INTERFACE TO IoT, ROBOTICS AND THIRD PARTY SYSTEMS

DATA/API MANAGEMENT PUBLICATION MONETIZATION

WERFENWENG Smart MaaS

Imagine that a family is planning a vacation in **Werfenweng**, a mountain village located 40 km south of Salzburg, Austria. Before starting a journey, they already have access to mywerfenweg.eu, a web app of Werfenweng. This platform developed by LuxActive KG includes all activities, points of interest (POIs), restaurants, and tours with offline GPS- navigation for this region and can be used anytime and anywhere. Using this web app, the family can already book the so-called W3-Shuttle, which will bring them from the train station in Bischofshofen to their accommodation, the WoodRidge Luxury Chalets. From there, the family has access to the web app oHA, where they get all information about their chalet and stay, access to available services like breakfast, dinner, or even a massage. Also, smart home services are available. And oHA is connected with the web app mywerfenweng.eu as well.

The family goes to the tourist agency where they get the **samo-card** allowing all kinds of soft mobility access, it will be connected with the web app mywerfenweng.eu or myoHA.at (**single-sign-on**).

For mobility, Werfenweng incorporated the samo-card in two different versions, depending on how the guests arrive:

· if the guests arrive by train, they get an enhanced version of the card, which is an additional offer by the tourism agency.

· if they, on the other hand, arrive by car, but ditch their car during their stay in the high valley of Werfenweng, they get the samo-card as well but with limited functions.

If guests arrive by car and use the car also during their stay, no samo-card is handed in to them.

Smart MaaS by Werfenweng: several soft mobility services are available for free and can be booked right away. The solution was developed by LuxActive KG. Werfenweng is a role model of the eco-friendly tourist area. Besides the mobility case, for example, the village has its own biomass power plant with the aim of being energy-independent. The FIWARE World Lego City shows all means of transport, including access via train and renewable energy as the main resource for the Smart City of the future - powered by FIWARE solutions and platform.

App oHA

S1 IOT PLATFORM

Isolated solutions are typically used in today's IoT world. They are not linked to each other and each has an individual process, surface logic and APIs. StoneOne's **S1 IoT Platform** provides both innovative platform technology and tools to securely combine, orchestrate, operate, and market diverse devices and services as well as data.

With the support of StoneOne, companies can deploy their individual digital service platform cost- and time-effectively either for Smart Cities, Smart Mobility or Smart Production and many other fields of application. As a **FIWARE Gold Member**, StoneOne relies on the use of essential **Generic Enablers** and support of the FIWARE community in the S1 IoT platform.

Orchestration of Heterogeneous Devices and Services

On the platform level, the various services are connected and configured on the basis of **standardized APIs**, such as **OpenMTC** or the **FIWARE Context Broker**. Onboarding not only captures a detailed description of the various services and devices, but also the integration APIs and data formats.

Clear Dashboards and Monitoring

Dashboards can be put together by the respective customer. Both solution-specific UIs and a selection of generic services that can graphically represent different data formats are available. The dashboards can also contain online monitoring widgets.

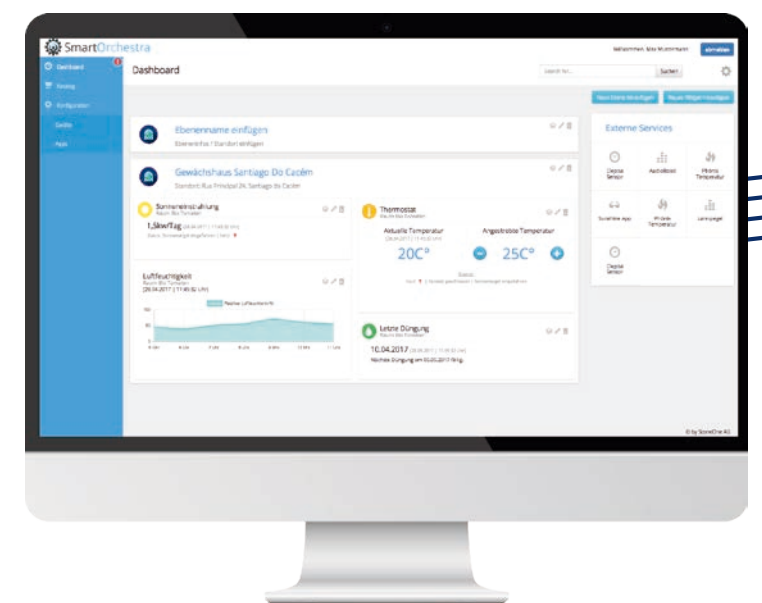### In the FIWARE World Lego City...

Building Use Case

Inside, a sensor measures the humidity and temperature in a bathroom to prevent mold early on. As soon as an adjustable threshold is exceeded, the ventilation starts automatically.

Pollution Use Case

In the second case, various pollutants are measured in the air outside the building. For this, Stone1 has installed a suitable outdoor sensor, which feeds data into a fine dust service. Once the measurement exceeds the configured threshold, a traffic light on the road turns from green to red.

THE FIWARE WORLD LEGO CITY
POWERING UP SMART CITIES WITH CONNECTED MOBILITY

The **FIWARE World Lego City** shows various domains and their interactions, with a clear focus on **Smart City**, **Mobility** and **Energy**. In this way we demonstrate the huge assets and achievements of the FIWARE community over time, and how they are interlinked and integrated.

Each of the six sectors of the model demonstrates different aspects of a Smart City:

> Sector 1 / City Hall:

The city acts as a facilitator of an open governance model and provider of data lake to maintain access and connectivity, as well as guaranteed interoperability based on standards. The city hall of Aarhus as an old and iconic building is paving the way to the future - Aarhus today is among the smartest and most innovative cities in Europe, which has been awarded the accolade of the city of culture and innovation on several occasions.

### > Sector 2 / Urban Media Space:

Public house, library and culture center. The remainder of the building is mainly the underground parking facility, which features an automated lift system and space for 1000 vehicles. The structure features a station and a light rail system with trains running through and under the building. The building is part of an effort to re-purpose former industrial areas of the Port of Aarhus into residential and commercial areas, thus represents a new model to rebuild industrial areas to make them more future-ready.

> Sector 3 / Smart House:

The Smart House is supported by the IoT sensor hub, which combines and evaluates various data sources and environmental sensors. Intelligent buildings can react autonomously to environmental data. This model shows that air pollution measured on the ground changes road use in urban areas and thus provides incentives for alternative means of transport.

> Sector 4 / Tourist City - Mountain Area:

Shuttle, car rental, horse-drawn carriage, paragliding, sleigh or personal chauffeur - these are just some of the free services offered to guests in Werfenweng, a small community in the state of Salzburg, Austria, as a part of the "Samo" initiative - Soft Mobility. This is an example of fully integrated green and sustainable mobility - a role model for smart mobility of the future. All services can be booked on a web application and can be used by any guest and family member independently at any time - on demand!
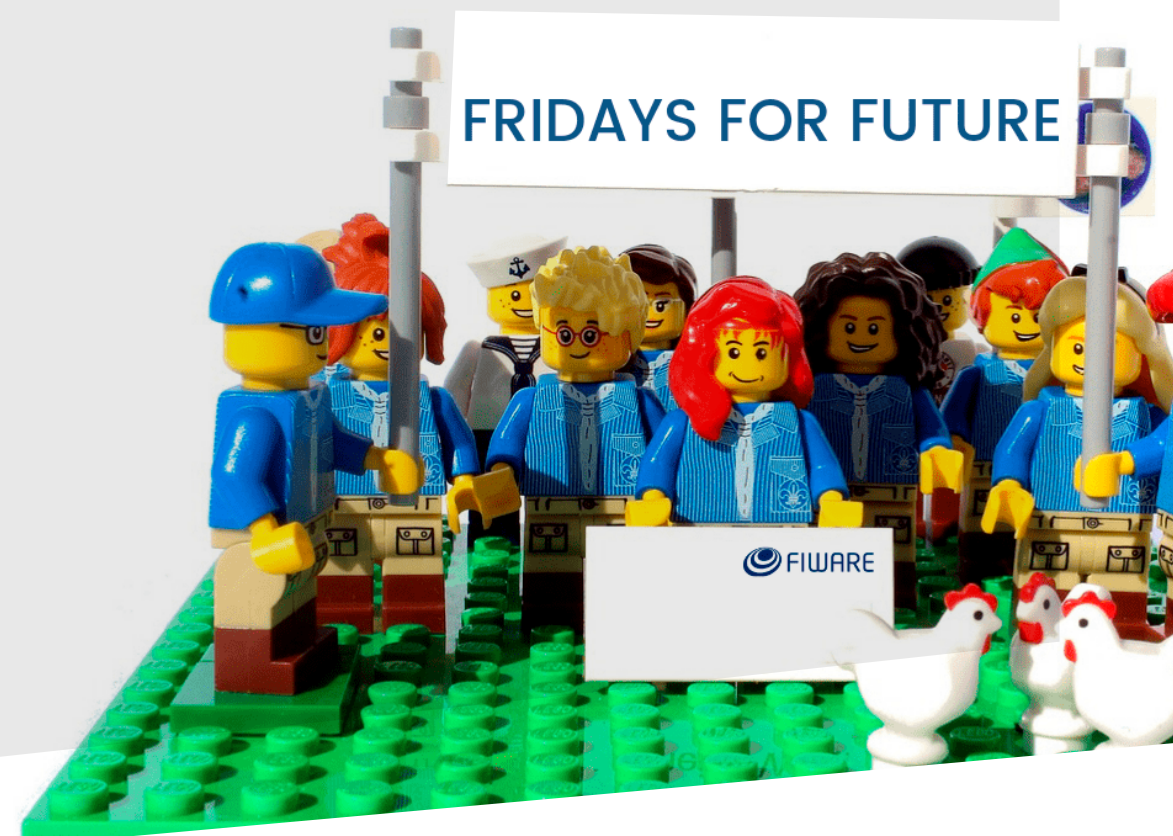
Sector 5 / **Energy**

The relation of future energy production, storage and distribution and future mobility is crucial and a pre-requisite for the success of both. The energy sector is central to FIWARE. It represents the concept of a recently funded project in North Germany, which shows how the energy sector can support future green mobility. The energy harvested from the sun (photovoltaic) and the wind (3 windmills) is used to produce large amounts of hydrogen gas (450kg per day) via a PEM electrolyser. The gas is produced, stored and made available at the gas fuel station in order to support the local bus, running between the cities of Niebüll and Husum in Northern Germany.

Greenpeace Energy is also one of the first adopters and uses the concept to feed/fuel a hydrogen powered vehicle fleet. The gas can also be fed directly into the gas grid, making energy immediately available anywhere in the country. The overall efficiency of the conversion, based on the so-called "power-2gas" concept, has reached >90%, as the process heat is used to feed various local heating systems such as "district heating."

Sector 6 / **Mobility HuB**

The mobility sector demonstrates how the various intelligent transport concepts are interlinked. A public train station brings people to the city, then different means of transport and storage are used for the last mile. The mobility Hub features ridesharing pick-up parking, an e-charger, a parcel station, and e-powered autonomous buses, scooters and bicycles. FIWARE members across the world provide feasible and smart solutions for these types of implementation.

The parking is monitored and its capacity is broadcasted using FIWARE generic components for Edge Computing and Analysis in order to be re-used by navigation systems like HERE or TomTom to guide the commuters to the next available parking slot, thus reducing search traffic, which causes currently 30% of all traffic in cities.

FIWARE - EMPOWERING CITIES

www.fiware.org