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OTE GROUP OF COMPANIES

Interoperability as-a-Service: The VICINITY approach

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IoT European Platforms Initiative

Project Overview

Open virtual neighbourhood network to connect IoT infrastructures and smart objects

- The VICINITY Consortium consists of **15** complementary **partners** from **9** different **European Countries** (*Denmark, Germany, Greece, Norway, Portugal, Slovakia, Slovenia, Spain and United Kingdom*)

  - **Duration:**

    January 2016 - December 2019

  - **Funding:** 7,5 m€

Motivating idea

- By the year 2020, the Internet of Things (IoT) is expected to have a value roughly *7.5 x that of the Internet today.*

- The **lack of interoperability** is considered as the **"most important barrier"** to achieve the **global integration of IoT ecosystems** *across borders of different disciplines, vendors and standards.*

- **The VICINITY project aims to build and demonstrate a platform linking various ecosystems providing "interoperability as-a-service"** for infrastructures in the IoT.
  The approach is bottom-up, decentralized, user-centric and standards–based, without relying on a single standard.

Main Objectives

VICINITY aims to:

- **Provide** the owners of connected IoT infrastructures with **decentralized interoperability.**
- **Build and demonstrate** a platform and ecosystem for IoT infrastructures, that offers "Interoperability *as-a-Service*".
- **Introduce** the **concept of virtual neighbourhood**, *where users can share the access to their smart objects without losing the control over them.*
- **Retain full control** of the **ownership and distribution of data** across the different IoT domains.
- The platform aims to **be device- and standard-agnostic** and relies on a decentralized and user-centric approach (*resembles a social network*).

Further challenges considered by VICINITY

- **Time-criticality** and **scalability** requirements, identified at inspection of pilot sites.
- **Reliability**, **availability**, **maintainability** and **safety** requirements emerging at stakeholder workshops.
- **Robustness requirements** (such as protection of DoS attacks) will be properly reflected in VICINITY's architecture.
- **Openness** and **system extensibility,** supporting the continuous evolution of the platform.

VICINITY : Concept & Approach

VICINITY platform connects different smart objects into a "social network" ***called as the virtual neighbourhood,*** *where infrastructure owners keep under control their shared devices and data thanks to web-based operator console* ***called as the VICINITY Neighbourhood Manager (VNM).***

Guest IoT infrastructures, VICINITY enabled services as well as the VICINITY auto-discovery space **are connected to a VICINITY interoperability gateway,** *by using the same VICINITY gateway API.*

By using the VNM, the user can control which of his/her IoT asset is shared with whom and to which extent.

To get connected to the VICINITY platform, the users are provided with the **VICINITY open interoperability Gateway.**

Once an IoT infrastructure is connected to VICINITY platform, the traditional IoT value chains become unlocked.

It "opens the door" towards ***seamless interoperability between IoT islands,*** *present in the current IoT landscape,*

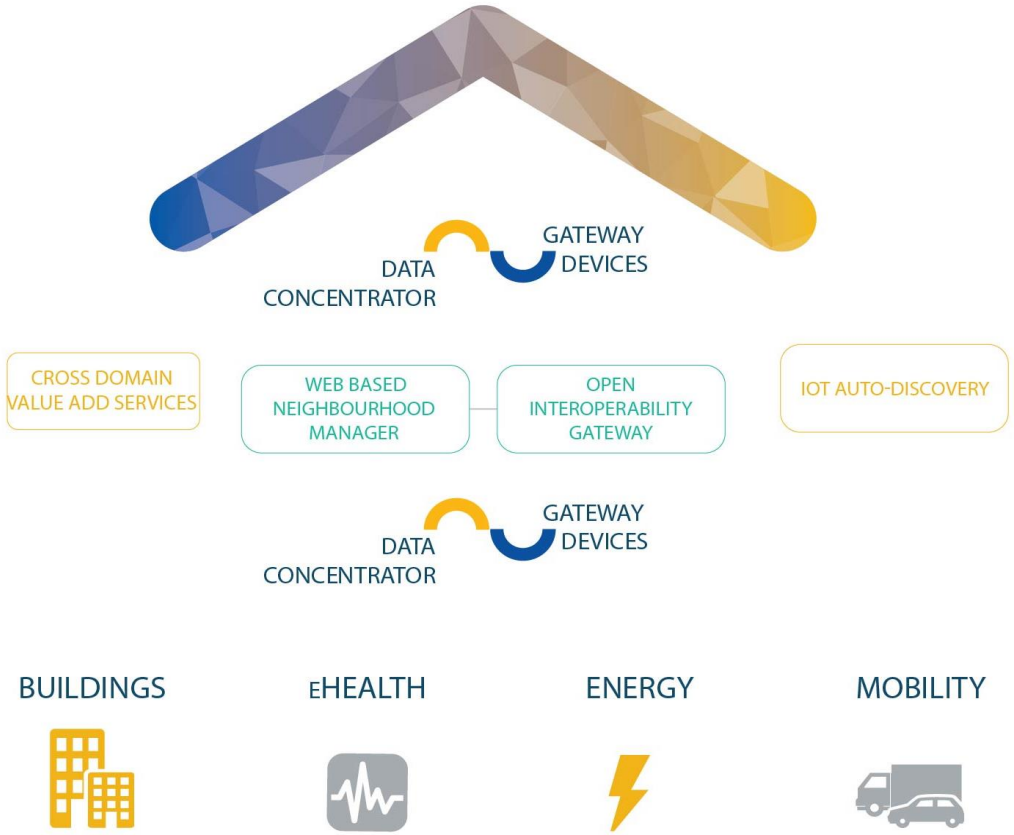
and;

it enables *the exploitation of* ***independent value added services,*** *including various cross domain IoT applications.*

VICINITY neighborhood concept

VICINITY comprises of five phases:

- *Definition of Requirements*
- *Standard Analysis & Framework Design*
- *Platform Implementation*
- *System Integration & Lab Testing*
- *Pilot Installation, Demonstration & Evaluation*



Schematic view of the VICINITY neighbourhood concept, interconnecting smart home and smart energy infrastructures and enabling cross-domain availability of IoT data.

Interoperability as a Service (1/2)

- **Main goal** of the virtual neighborhood approach is to ***provide interoperability as-a-service*** and not to define yet another standard.

- Therefore, the **main challenges** **are** the ***lack of an IoT protocol for interoperability*** as well as ***dealing with security and privacy issues***.

- A **main idea** is to ***allow IoT operators and users to continue using their tools, specifications and processes*** and to *set the conditions of their collaboration upon their interests.*

- Furthermore, aiming for a **decentralized network enables achieving peer-to-peer security**, *because the peer-to-peer configuration naturally supports end-to-end encryption of communication between the different peers.*

Interoperability as a Service (2/2)

- The VICINITY infrastructure is to **achieve decentralized interoperability between integrated IoT infrastructures and value-added services through a peer-to-peer network** of VICINITY Nodes, *where the infrastructure and/or the service managers can "share" access to their IoT objects, without losing control over them.*

- *By setting-up partnerships between organizations and sharing access rules by managers,* **a social network** *(called as the* ***"virtual neighborhood"****)* of organizations, integrated IoT infrastructures and value-added services **is created.**

VICINITY Standardisation Analysis

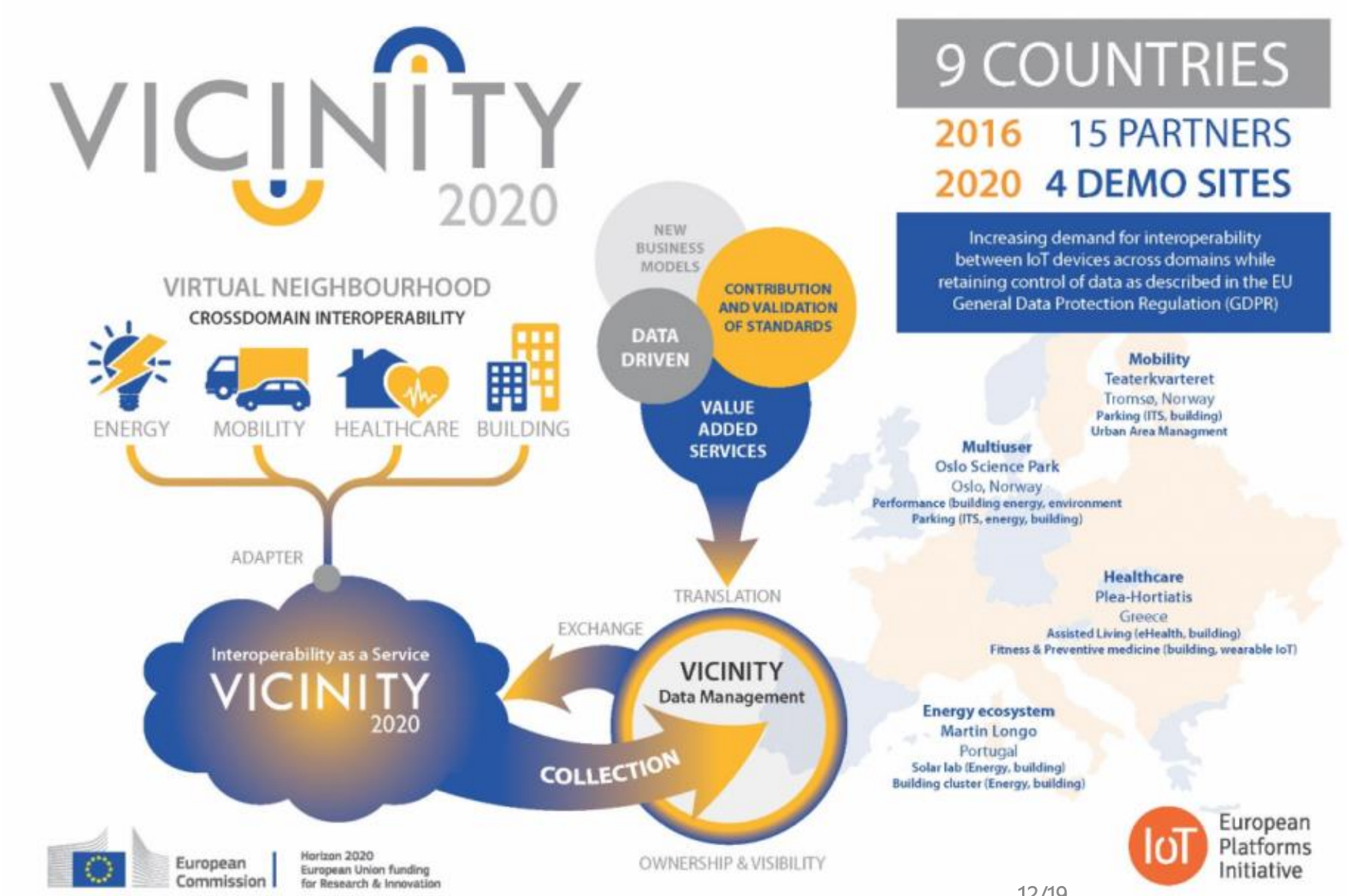
VICINITY has undertaken a thorough review of all existing standards and platforms, selecting those that are needed to build a service or to create some interoperability among different standards and platforms.

- **Communication level:** WiFi and ZigBee.
- **Semantic layer:** Discovery and classification of services and the communication at this layer is summarized under the term Machine-to-Machine communication (M2M). *Achieving interoperability and establishing services requires semantic knowledge from different domains.*
- VICINITY partners have been developing **specific ontologies** for the Building and Energy domains as extensions to the *Smart Appliances REFerence ontology (SAREF)*. The VICINITY ontologies will also be implemented in the W3C Web Ontology Language standard.

VICINITY Ontologies

- VICINITY ontology network will be composed by **cross-domain ontologies**, *addressing the modeling of general concepts like time, space, web things.*
- It will **represent** the information for **exchanging IoT descriptor data** between peers.
- Domain-oriented ontologies would **cover vertical domains,** *such as health, transport, buildings, etc.*

Demo Sites Overview

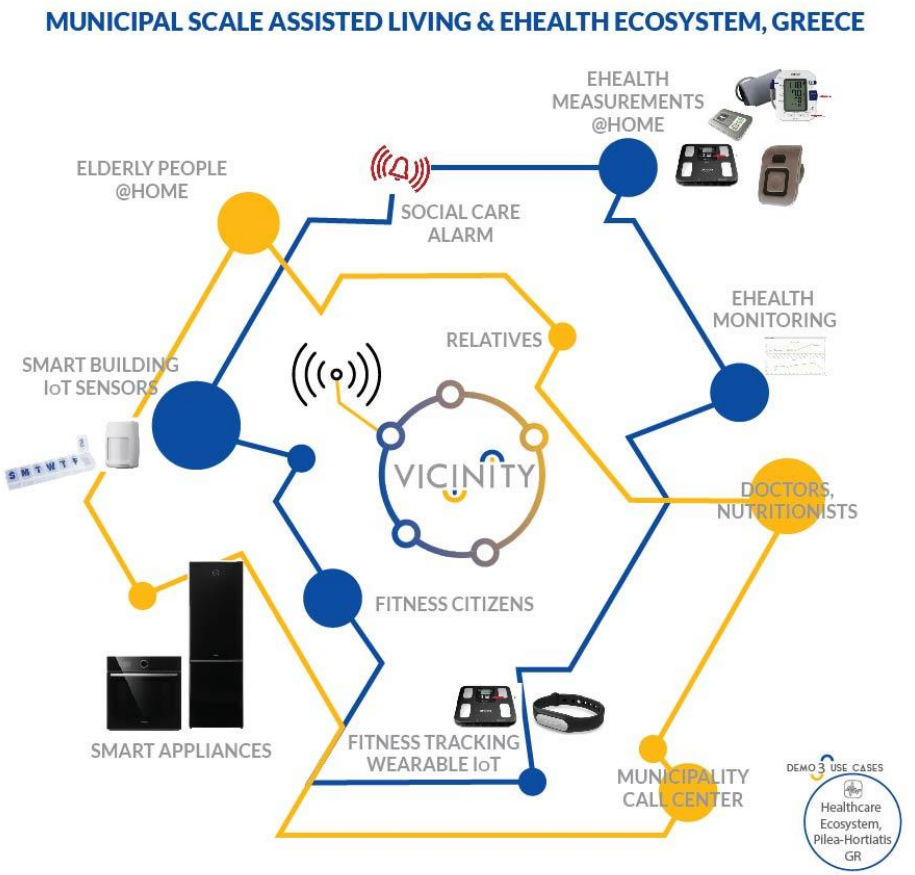


Pilot Use Cases

eHealth & Assisted Living Demo

eHealth & Assisted Living
(eHealth, Smart Building)
Fitness & Preventive Medicine
(eHealth, wearable IoT)

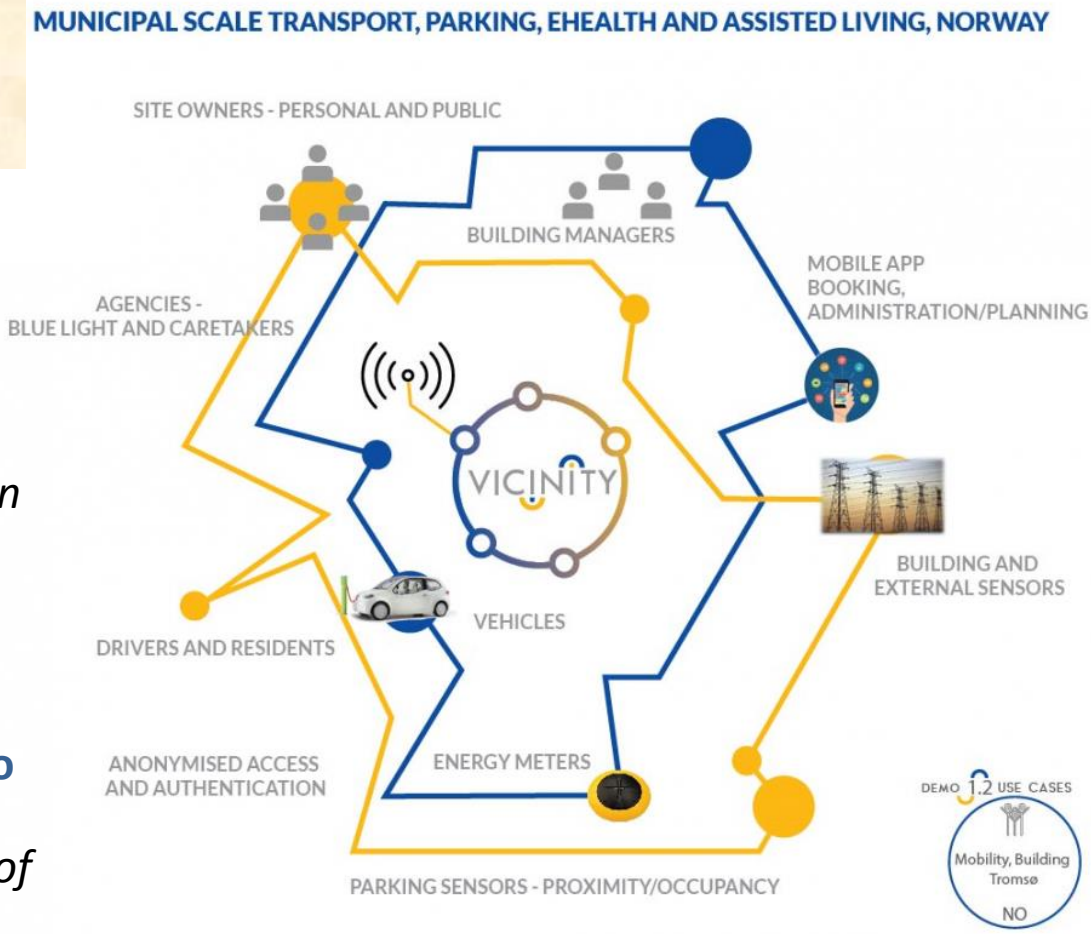
- **Detecting and providing reports on abnormal behaviour**, *based on information collected about health profile and combined with current status measurement and household*.
- **Triggering alarms** for Municipality Call Centre and respective doctors.
- **Evaluation of citizens health** and **offering health improvement advice** *based on measurement data and registered exercise performed.*
- **Monitored on a daily basis** *by municipality with doctors/ nutritionist and physiotherapist.*



Transport, parking, eHealth and Assistive Living Demo

Shared Parking Access for Bluelight Agencies

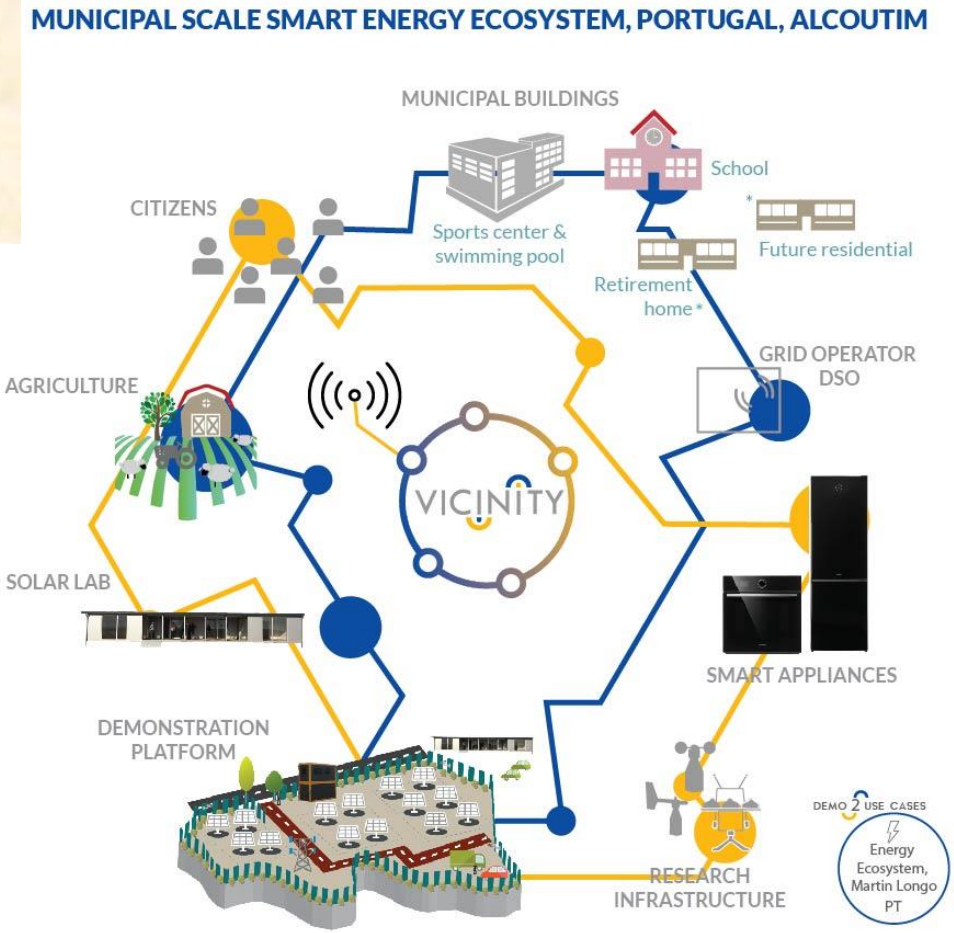
- **Predicting occupancy and assign parking space,** based on priority for blue light agencies, particular needs from driver or passengers due to disabilities, and weather conditions.
- **Assigning charging stations** *based on availability within time slots and availability of affordable, green energy.*
- **Ensuring only authorised and authenticated visitors gain access to the garage facilities** *in case of an emergency situation arise with one of the residents.*



Smart Energy and Buildings Demo

Solar Demonstration Platform (RES generation), Solar Lab (Energy, Building) Municipal buildings cluster

- Continuously **measure energy consumption** and consumption profiles.
- **Load balancing of energy** in municipal buildings like schools and nursery homes.
- **Generate energy profile** for households and public spaces.

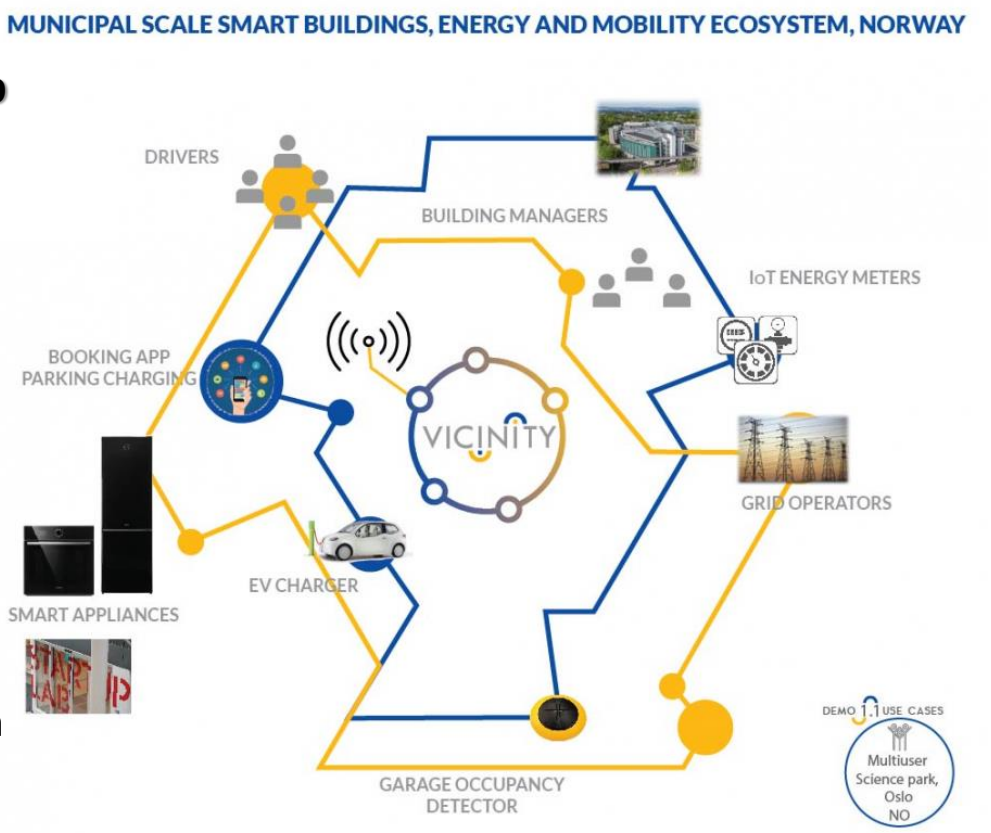


Smart Buildings, Neighborhood and Cities Demo

Building Performance (Building, Energy, Environment)
Parking (ITS, Energy, Building)

Information from the energy part of the intelligent building system and the Living Lab VICINITY Demonstration site, *together with real-time information about* ***Indoor Environmental Quality*** *(IEQ) and information about buildings physics from a Building Information Model (BIM),* **can give an estimate of:**

- The **use load** of the building,
- The **performance of the building** and enable the calculation of a real-time estimation of the building's energy flexibility.
- **Smart parking and EV Charging** combined with information and services form the building and energy domains.



VICINITY partners

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Atos

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Thank you !!!

https://www.vicinity2020.eu/vicinity/

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