Interoperable Iot Solutions

EDGE COMPUTERS LEADING THE DIGITAL TRANSFORMATION IN THE ENERGY, BUILDINGS & HOME SECTORS

WHO WE ARE

Innovative SME, established in 2007 by skilled people with R&D and industrial experiences:

- **Embedded Electronics (HW/FW)**, Wireless Sensors Networks, rapid prototyping,
- **ICT** (edge computing, web, cloud, communication protocols, IoT open-source Software Frameworks)
- **IoT enabling technologies**, Sensors → Edge → Cloud Data Retrieval and Cloud → Edge → Sensors Command & Control
- **Energy modelling**, Thermography Certified Operator.

TERA has gained valuable experience in the development of **custom electronics** *delivered to several companies and has contributed to the development of* **original high-tech solutions** *by participating in national and European cooperative R&D projects.*

OUR NETWORK

In today's fast-moving markets, companies no longer want only a supplier that responds to requests at minimum cost, they **need an innovative partner who can quickly transform ideas and projects into valuable solutions with minimal liquidity**, and that's what we do.

We invest around 30% of our turnover per year **in research and development**, to offer our customers and partners personalized services and solutions not yet on the market.

CUSTOMERS

ENTERPRISE INNOVATION AND COMPETITIVENESS WORKING GROUP:

WHAT WE DO

IOT EDGE COMPUTERS
HW Tools to link the Field and the Cloud

BEETA™ Box and GIoE
- GIoE DIN Rail mounting
- Beeta™ Box smart design case for indoor
- Communication Protocols (10+ embedded, wireless and wired)
- Open-Source SW Tools and Frameworks

DIGITAL ENERGY
HW&SW Tools linking the Field to the Cloud

BEETA™ MoCo & BEETA™ Reader
- "Plug&play" smart metering
- Interoperable with Energy Players Information System, SW Tools and Framweworks
- Beeta ™MoCo controller for VPP and Energy Communities already compliant in retrofit with the most popular BESS

INTELLIGENT BUILDING & HOME
end-to-end IoT solutions for monitoring & control

BEETA™ Ecosystem (HW/SW)*
- Beeta KIT

Beeta Box, GIoE (Edge Computers)
BeetaPower (smart meter reader)
- Beeta Premium
- Beeta Game

MARKETS: B2B

MARKETS: B2B

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EDGE COMPUTING IOT DEVICES

Beeta™ Box

Edge computer for indoor, multisensory interface, OTA upgradable, sensors and actuators on board.

GIoE

Industrial edge computer, DIN rail mounting for outdoor, multiprotocol, OTA upgradable, customizable.

Beeta™ MoCo

Modulation Controller managing bi-directional energy flows of battery storage inverters and other electrical equipment and loads, also in retrofit.

Beeta Reader

Plug&Play Smart Meter Reader, it reads 1G and 2G fiscal smart meters by e-distribuzione (both consumptions and photovoltaic production).

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Main B2B Market

EDGE COMPUTERS FOR GENERAL PURPOSE APPLICATIONS

EDGE COMPUTERS FOR IOT ECOSYSTEM
Full IoT interoperable Approach

To fully comply with the unprecedented emerging interoperability due to the capillary diffusion of secure IoT compliant devices, TERA's approach is the most flexile one:

- **Edge computers**, new generation of control units, born with the concept of interoperability typical of IoT. They are based on Linux and can be updated remotely (OTA upgradable).

- **Multiprotocol: > 10 communication protocols** (Ethernet, RS485, WiFi, BT, ZigBee, Zwave, Modbus, CANbus, powerline communication-PLC, A and C bands, according to CEN/CLC/ETSI/TR 50572, EN 62056-7-5.

- **Compatibility with third-parts Hardware** (field devices, sensors/actuators)

- **Compatibility with open source software Framework** (Node-RED, OSGI OpnenHab, HomeAssistant) and tools (MQTT, REST / API, OPC-UA), free-of-charge, or licensed ("FIN" by J2Innovations, "IBM IoT" by IBM, "AWS IoT Greengrass" by AWS). Vendor lock in

TERA' S SOLUTION ADOPTIONS: THE PILLARS

IoT and Edge Computing: the most flexible approach

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2

3

Tier 1
Basic Monitoring

open and vendor-lock-in free universal data reading.

Tier 2
Resilient and Flexible architecture (local, remote storage and computational capabilities)

Edge Computers for real-time alerts generation and control
Cloud for heavy data analysis and backup and centralized multi-tenant management

Tier 3
Open Software – modular and scalable approach

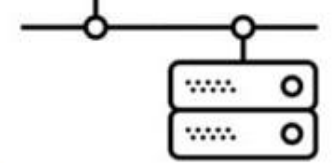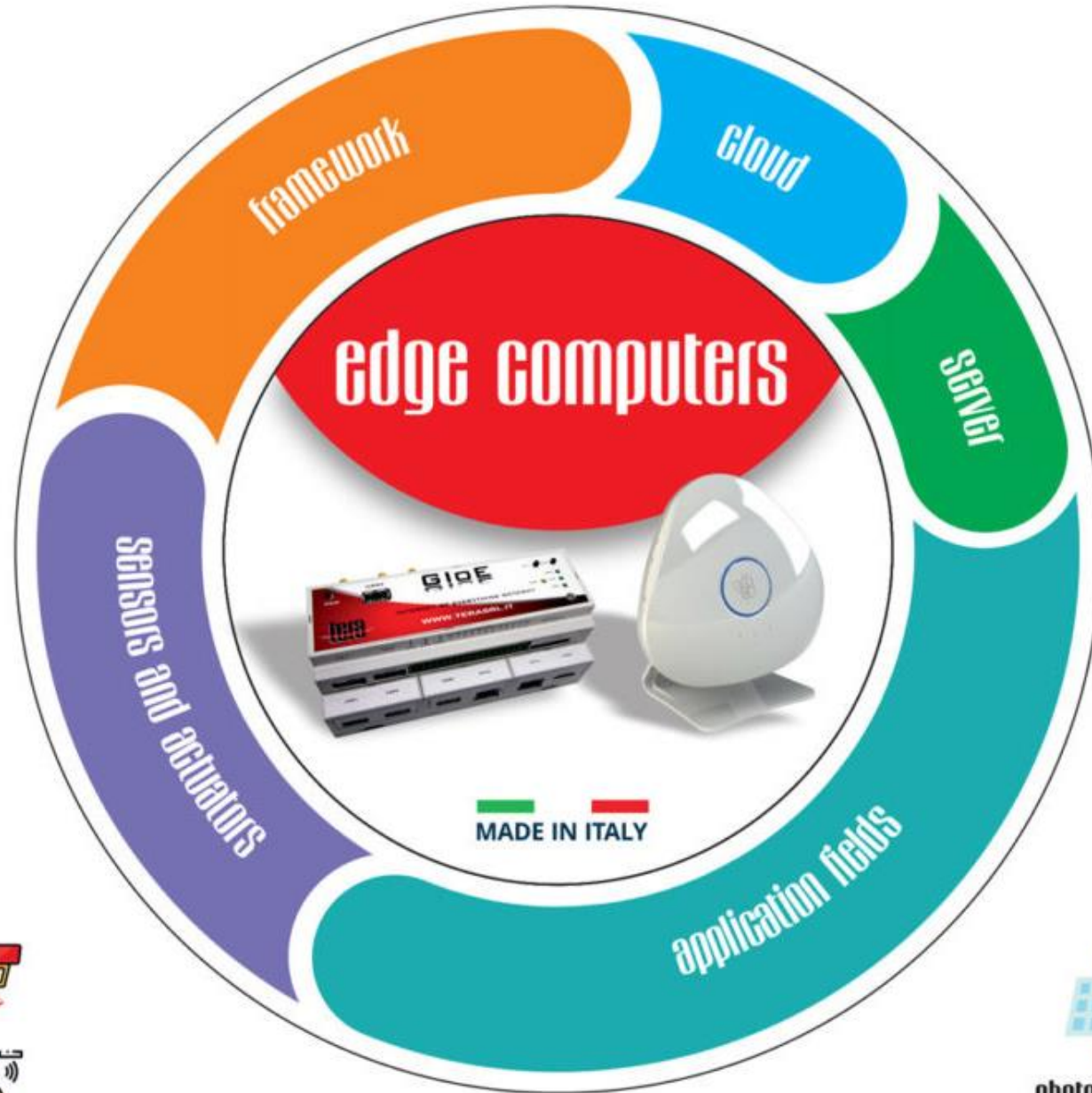vendor-lock-in free IoT device to compatible with third party sw and available for different applications

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BEETA™ BOX EDGE COMPUTER
For indoor applications (home & office)

On/off key

WPS Join key

Programmable key

SD slot

Power State LED

LAN/Internet LED

Local device Network LED
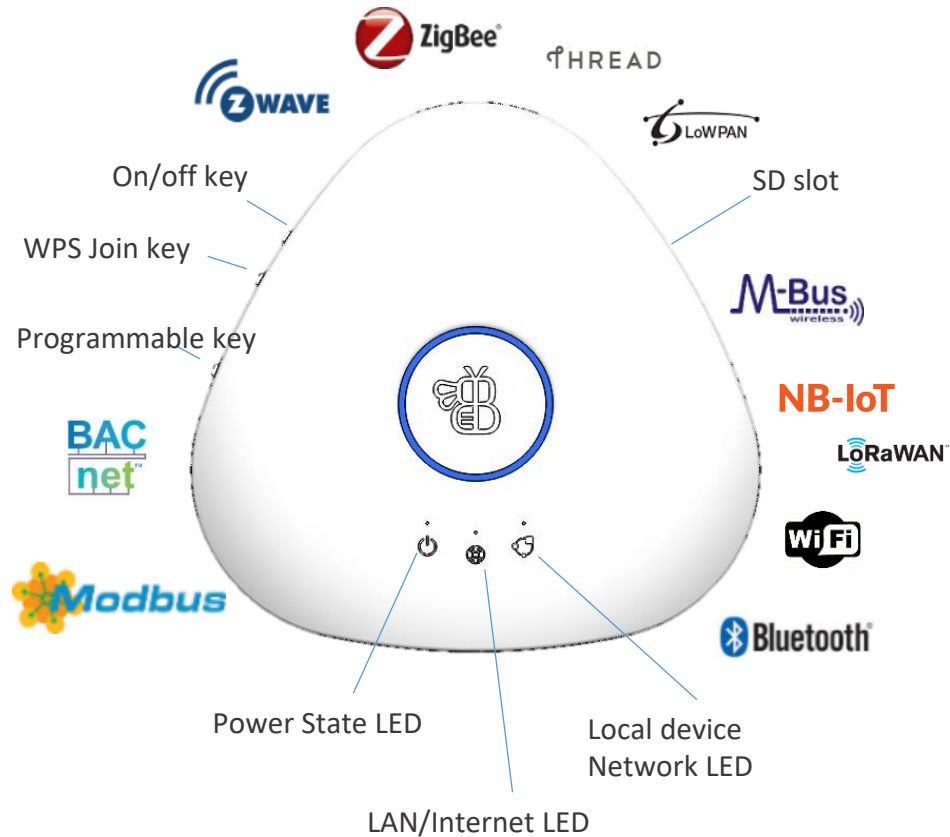
- Rechargeable internal battery
- RS485 (e.g PV inverter, energy meters)
- S0 + dry contact input
- Open collector output
- Dry Contact (Max 2A @250Vac) Output
- Powerful CPU, Linux embedded
- 2x SD card slot
- 2x 1,5W loudspeakers
- OTA upgradable
- Registered Design (Desk/wall/ docking station mounting capabilities)

Original electronics by TERA
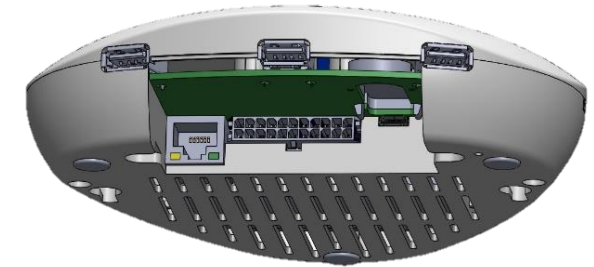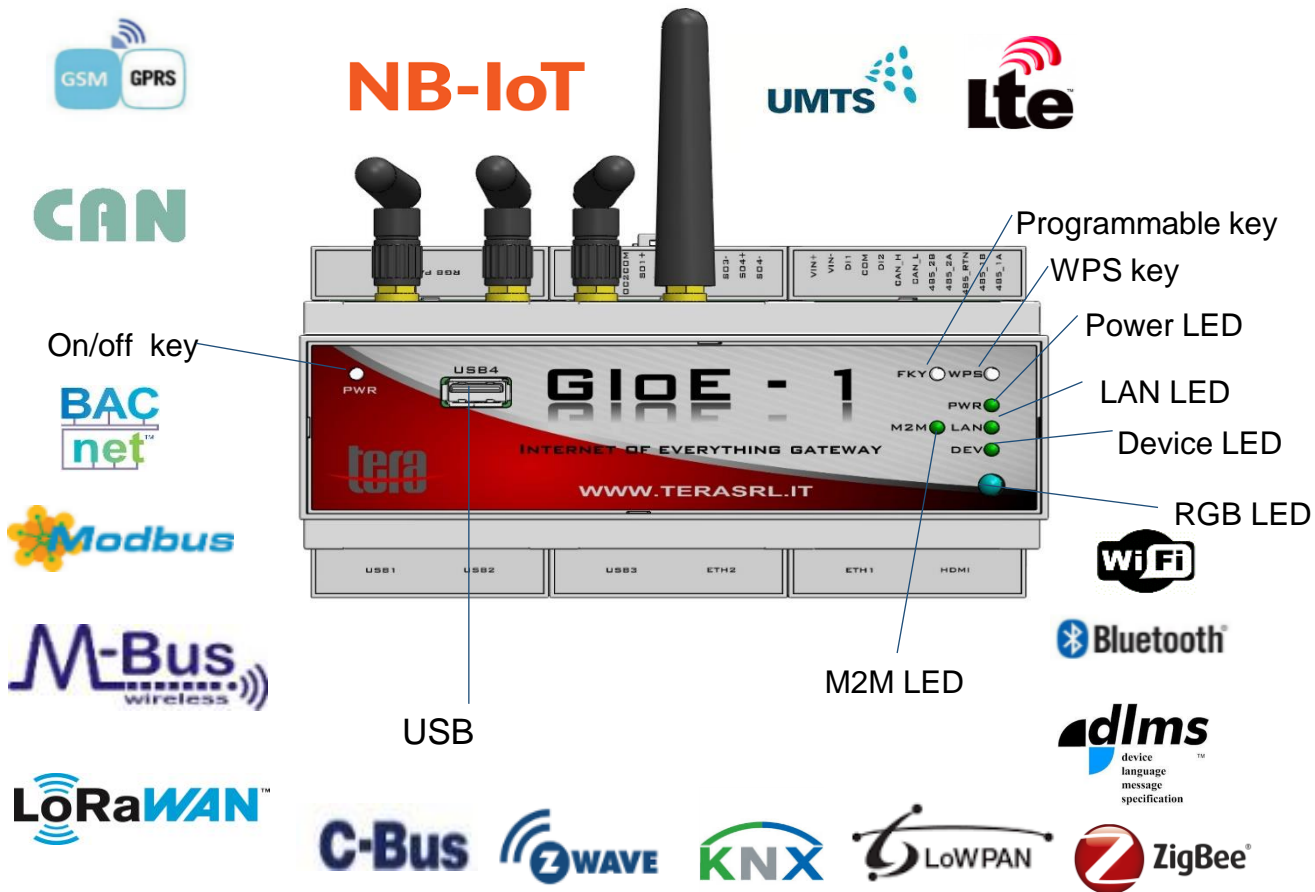
Onboard sensors
- ✓ Temperature
- ✓ Humidity
- ✓ Pressure
- ✓ Sound (microphone)
- ✓ Presence and movement
- ✓ Synthesis (patent pending)

IEC-62256 (subset) PLC Communication
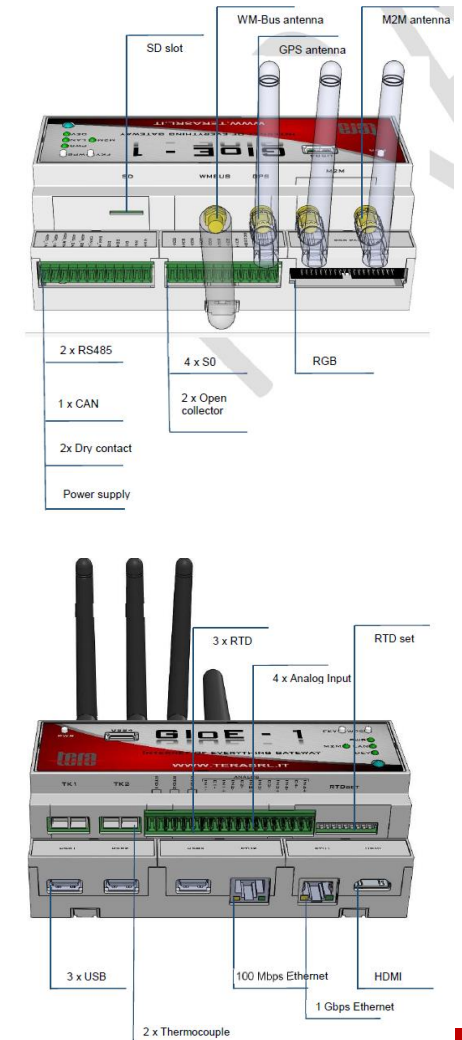(PLC, C band,interface CEN-CENELEC-ETSI TR 50572:2011)

GIoE EDGE COMPUTER
DIN-rail mounting, rugged

GSM GPRS

NB-IoT   UMTS   Lte

CAN

On/off key

BACnet

Modbus

M-Bus wireless

LoRaWAN

C-Bus   ZWAVE   KNX   LoWPAN   ZigBee

Programmable key
WPS key
Power LED
LAN LED
Device LED
RGB LED

WiFi

Bluetooth

M2M LED

USB

dlms
device
language
message
specification

- 4x USB; 10/100Mbps Fast Ethernet + Gigabit ethernet; 1x CAN
- 2x RS485 (e.g PV inverter, energy meters); RGB + HDMI; 2x SD card slot
- S0 + dry contact input + analog input; 2x K Thermocouple connector; 3x RTD
- Open collector output; Dry Contact (Max 2A @250Vac) Output
- Linux embedded; OTA upgradable

Original electronics by TERA

SD slot   WM-Bus antenna   M2M antenna
GPS antenna

2 x RS485   4 x S0   RGB
1 x CAN   2 x Open collector
2x Dry contact
Power supply

3 x RTD   RTD set
4 x Analog Input

3 x USB   100 Mbps Ethernet   HDMI
1 Gbps Ethernet
2 x Thermocouple

BEETA™ MOCO
Edge Computer for Demand-Response

- Field level device for «Demand-Response» operations;
- Interoperable with third party sw/hw
- Multiprotocol: RS485, ETH, WiFi
- Flexible retrofit solutions, easy to install and manage (Linux embedded, OTA upgradable, OC output for external relays)
- Already compliant with several photovoltaic and BESS (battery Energy Storage Systems) inverters for applications in Energy Communities and Balancing Service market
- DIN-RAIL mounting case

BEETA™ MOCO monitors and manages bi-directional energy flows of battery storage inverters and other electrical equipment and loads, also in retrofit. It can be used in combination with third-party software platforms, both local and cloud based, for the implementation of integrated electric energy flows management systems in smart grids and energy communities

Original electronics by TERA

BEETA™ READER

(evolution of BEETA POWER, available Q4 2020)

Plug&play smart meter reader

- Plug & Play Smart Meter Reader (both 1G and 2G/"chain2 version)
- AC-DC Power Supply (USB output)
- WiFI, ETH, USB
- Simultaneous monitoring of Energy Consumptions and Productions
- 2 LED (Power and Modem)
- APP for initialization and use of the device
- Up to 10 minutes power backup (blackout tolerant)
- Plastic case with standard electric plug

Original electronics by TERA

dlms
device
language
message
specification ™

meters AND more
OPEN TECHNOLOGIES

BEETA READER and BEETA POWER are able to read smart meters for electric energy through powerline communication (PLC), in A band and alco in C band (according to CEN/CLC/ETSI/TR 50572, EN 62056-7-5).
Beeta Power communicates by USB with gateways/edge computers and Beeta Reader communicates directly towards Web, app and custom SW applications

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SMART ODORIZER
Prototype available – industrialization in 2021

Air quality, smart odorizer

- - 2 fragrances (18ml standard refill)
- - WiFi Connection
- - multicolor LED, loudspeakers
- - T, Hr , Air Pressure, gas sensors, microphones

Original electronics by TERA

PATENTED

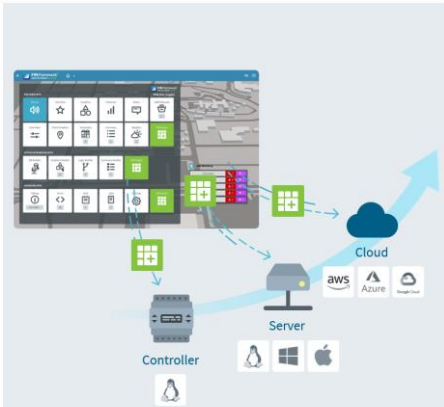# 4 OPTIONS FOR USING TERA'S TECHNOLOGIES
Edge computer approach

with pre-installed LINUX OS
-clients choose the software suite-

with FREE OPEN SOURCE SOFTWARE MQTT, Node-Red, OSGI, OPC-UA, etc…

with LICENSED SOFTWARE
as FIN Framework by J2Innovations, IBM edge, AWS IoT Greengrass

with CUSTOM SOFTWARE PACKAGE Tera supports clients in customizations

*TERA and J2Innovations (a SIEMENS Company) guarantee full compatibility with innovative open source, licensed software FIN Framework

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INDUSTRY 4.0
Tera4Energy: energy monitoring and efficiency solution

- Optimization of corporate performances

- Energy and cost saving (up to 30%)

- Updated and immediate knowledge of machinery health

- Production waste reduction

- Product quality improvement

- Costs saving and greater efficiency in maintenance operations

TRANSPORTATIONS & LOGISTICS

Remote Monitoring and Atmosphere Control System for Agrifood Logistics
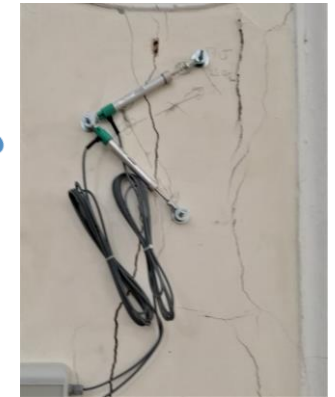
- Food quality improvement

- Shelf-life increasing

- Maximum duration of transport

- Production waste reduction

- Remote sensor management

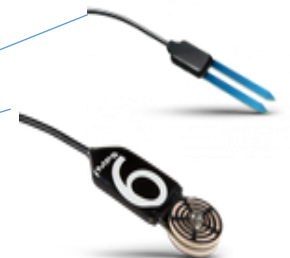- Location of the container (GPS available)

SMART ASSET
Sensor derived monitoring od outdoor assets

- Soil and environmental monitoring
- Inclination
- Cracks
- Soil Moisture

KNOW MORE

B2B Market

DIGITAL ENERGY

# EDGE COMPUTING LEADING THE DIGITAL TRANSFORMATION
In the energy sector

- In the new EU scenario opened by the **Green New Deal** and **EU Clean Energy Package** a key role is played by **Demand-Response technologies, both for Balancing Services** (delivered also by small RE plants and by prosumers, managed by "**Aggregators**", **i.e. BSP)** and **Energy Communities**.

- The small-scale power generation sources (DER, Distributed Energy Resources) will be the protagonists: **solar energy** will allow more and more consumers to become **prosumers** and, thanks to **storage systems** and **low cost electronic systems,** to become the active elements of the system, ie. **active prosumers.**

- The first step for the adoption of intelligent solutions is the implementation of energy monitoring systems **(smart metering),** that also warn users in case of anomalies and malfunctions

- **The new energy system's scenario requires a flexible and interoperable environment able to manage a huge amount of data in a very short time**, and this is why **edge computing** and **IoT** are the most secure and efficient technology supporting this evolution.

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DIGITAL TECHNOLOGIES FOR ENERGY COMMUNITY, BSP (VPP)

The architecture built with Tera technologies

- Energy flows monitoring and control (execution of modulation commands on "batteries", BESS - Battery Energy Management System - and modular loads)

- Network stability assessment

- Updated knowledge and ready-to-use insights on energy consumption/production
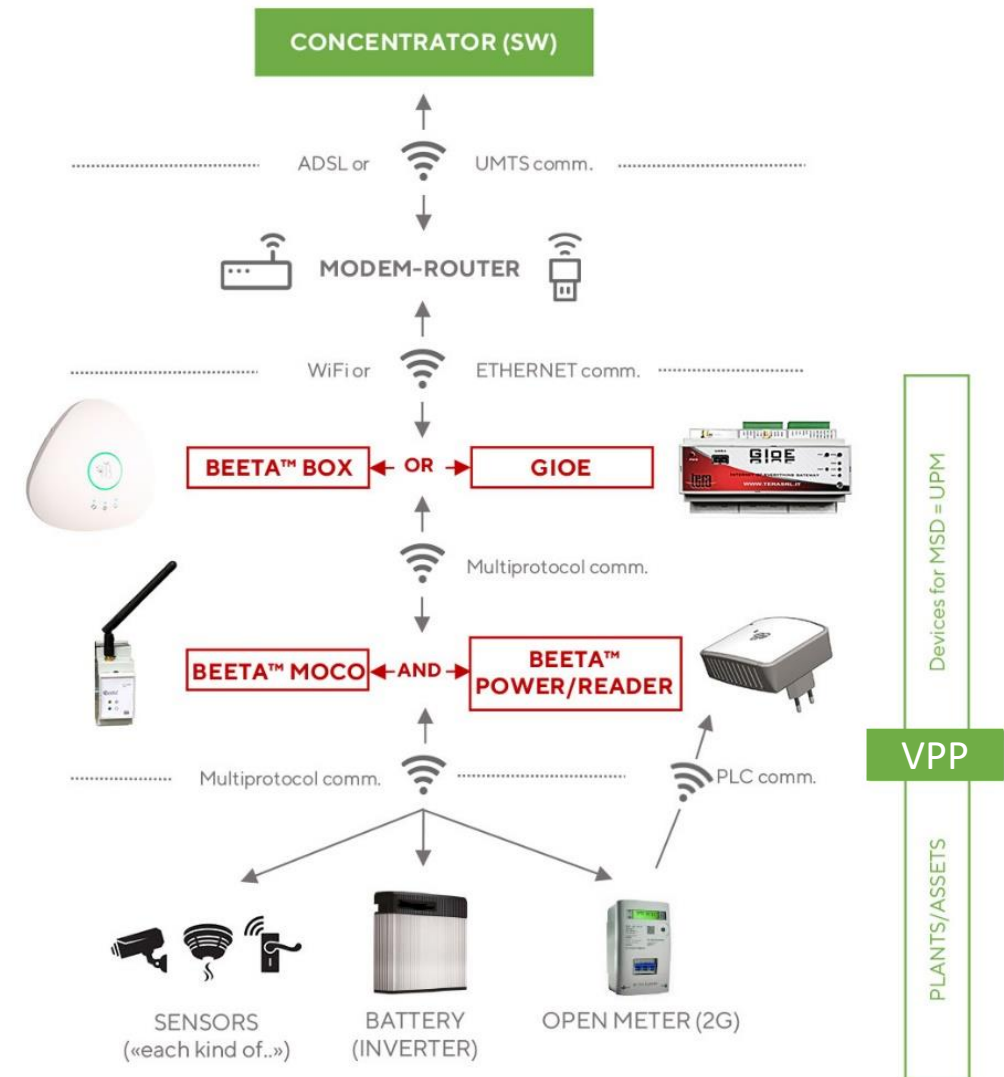
VPP (UVAM)
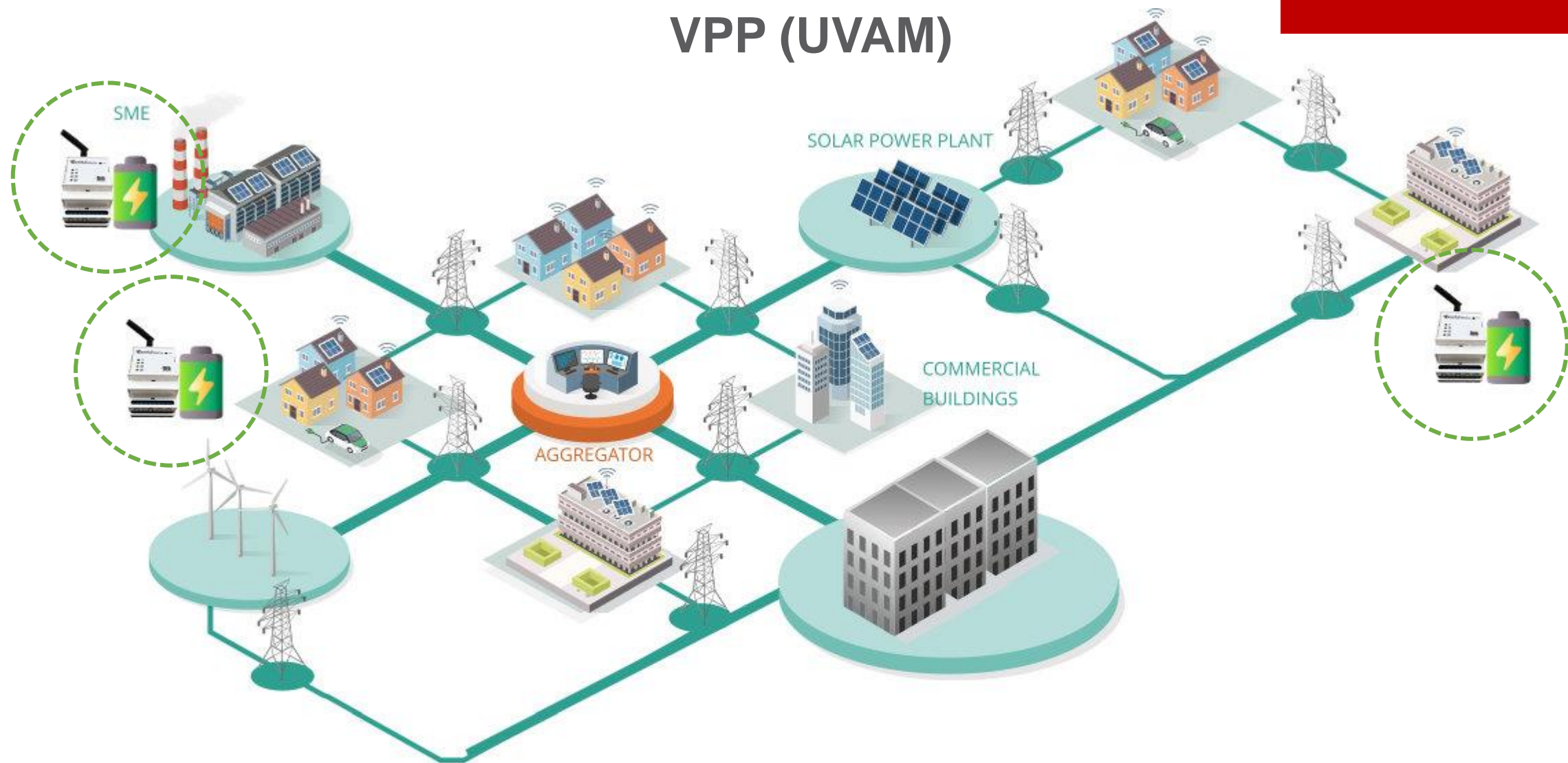
BESS - Battery Energy Storage System

Beeta (™) MoCo - Modulation Controller (BESS/ Electrical loads)

Beeta (™) Reader - Smart Meter Reader

ENERGY COMMUNITY

CONSUMER

CONSUMER

CONSUMER

CONSUMER

PROSUMER

CONSUMER

(MV/LV) SECONDARY SUBSTATION

BESS - Battery Energy Storage System

Beeta (™) MoCo - Modulation Controller (BESS/ Electrical loads)

Beeta (™) Reader - Smart Meter Reader

MODULAR AND SCALABLE SOLUTIONS FOR DIGITAL ENERGY
Integration of Smart Metering, Energy Flow Control, contextual Awareness

- **SMART METERING**

  Beeta™ Reader (plug&play powerline meter reading compliant to Italian regulation);

  Mandatory for Energy Communities, useful for VPP

- **DEMAND RESPONSE**

  Beeta™ MoCo: field controller for the management of energy flows, it executes the modulation commands on "BESS" (Battery Energy Management System), and modular loads. It communicates via modem-router to the "concentrator /aggregator/management" software and works in retrofit also on existing systems of different brands and models;

  Mandatory for VPP and Active Energy Communities.

  Beeta™ MoCo with or without Beeta™ Reader

- **FULL BUILDING AUTOMATION**

  Beeta™ MoCo + Edge Computer (GIoE or Beeta Box + sensors and actuators from marketplace: electrical, environmental sensors, etc. ..): this configuration allows a complete smart asset management;

  SW for interoperability with "Concentrators/aggregators/management" software platform and third-party application SW + UI, both web-browser and mobile app, where a huge variety of algorithms can be implemented for different applications, e.g. AI for the prediction of energy consumption and production, Blockchain for securing transactions.

B2B Market

INTELLIGENT BUILDING & HOME

INTELLIGENT BUILDING & HOME
Open hardware and software for full interoperability

Tera solutions adopt an open approach and interact with third party hardware and software for IoT, Artificial Intelligence, Machine Learning, Big Data Analytics.

THERMOSTATIC VALVE

SMART METER READER

SMART PLUG

TEMPERATURE / HUMIDITY
Water Leakege

AIR QUALITY

PRESENCE MOVEMENT /
BRIGHTNESS

CONTACT SENSOR

DISPLAY

CAMERA

WEATHER STATION, CRACK METER, STRAIN GAUGE
SOIL HUMIDIT, INCLINOMETER

THERMAL ENERGY

SMOKE DETECTOR

WATER/ENERGY
GAS METER

INTELLIGENT BUILDING & HOME
Iot Edge computers for Intelligent Buildings & Home
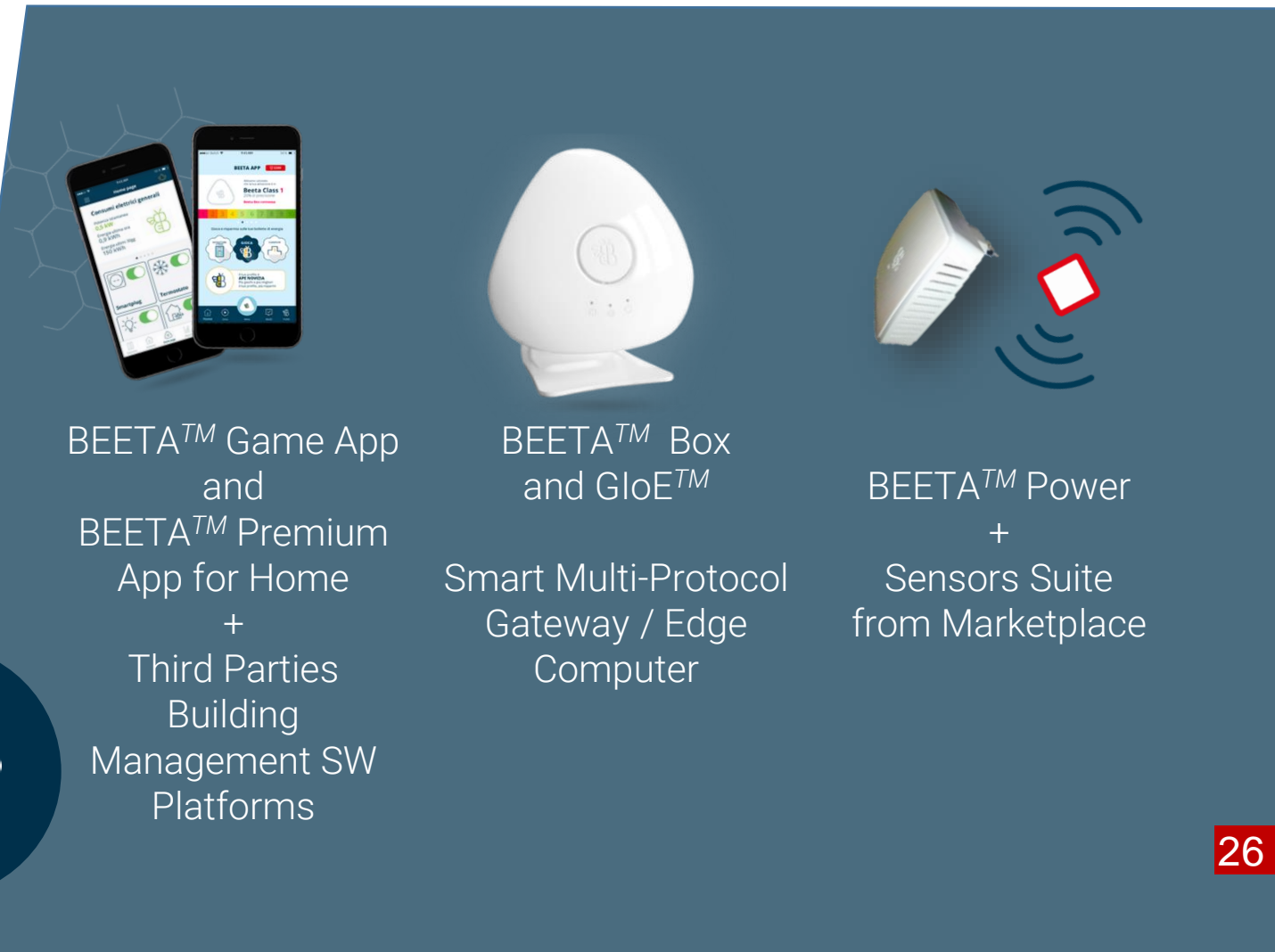
B2B2C end-to-end solution

Make Building Smart means enable Energy, Comfort, Ambient Assisted Living, Security Measurements to analyze Inefficiencies and adopt Counter measures

Make Building Smart means engaging users

Beachhead market: photovoltaic prosumers

B2B2C:

Work in progress: AI (Machine Learning algorithms), Big Data Analytics enabling exploitation of data

BEETA^{TM} Game App and BEETA^{TM} Premium App for Home
+
Third Parties Building Management SW Platforms

BEETA^{TM} Box and GIoE^{TM}

Smart Multi-Protocol Gateway / Edge Computer

BEETA^{TM} Power
+
Sensors Suite from Marketplace

SMART BUILDING
Energy Efficiency and automation

- Environmental comfort improvement

- Energy consumption/production monitoring

- Measurement and metering of thermal energy in fluid systems (energy counter)

- Predictive maintenance tool

- Possibility to interact with 3rd party devices sensors/actuators) and software

- Infrastructures stability monitoring (unsafe buildings, bridges, …)
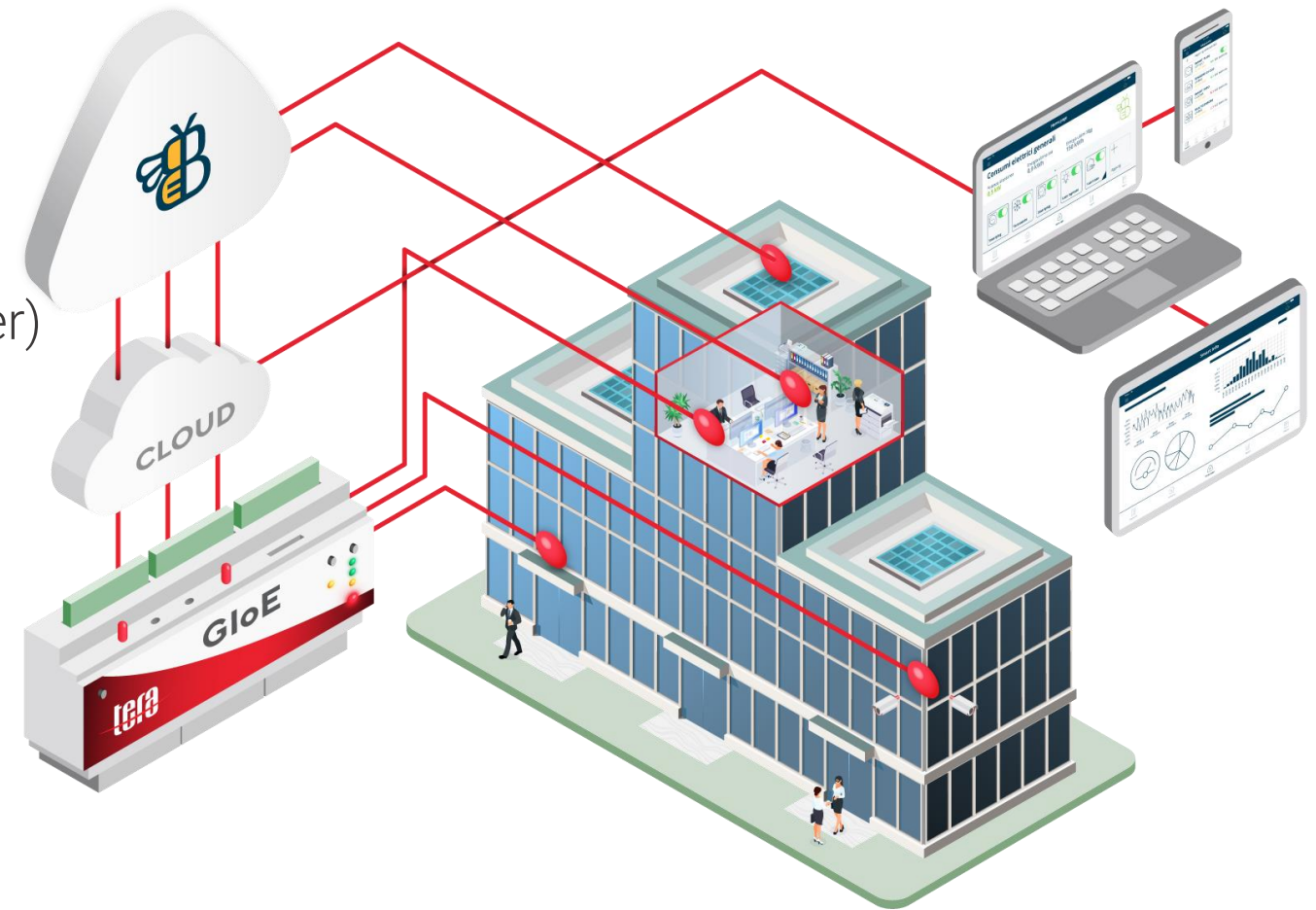
AWARDS & ACKNOWLEDGMENTS

2020 Finalist at «Next Energy4» competition, promoted by Terna, Cariplo Foundation and Cariplo Factory.

2019 Selected by ICE to be part of **Italian Pavillon @ World Mobile Congress**

2017 Selected to be part of Pioneers 500 competition

2016 Selected to be part of **GSMA Mobile IoT** showcase (NB-IoT technology)

2016 Finalist at BNP Paribas Cardif Open-F@b Call4Ideas

2016 Selected to be part of FIWARE success story at IoT Solution World Congress and Smart City Expo World Congress

2016 Selected to be part of Engie Lab at VIVATECH LAB - Paris

2016 Seal of Excellence awarded by UE

2016 CRIBIS D&B rating 1

2015 INCENSe - INternet Cleantech ENablers Spark project

2015 Part of "100 ITALIAN ENERGY STORIES", issued by ENEL and Symbola Foundation presented @ COP21 meeting, Paris 19th April 2016

2015 Finalist @ South Summit, greatest Spain competition for SMEs and startups

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Original Solutions for Energy Efficiency

info@terasrl.it

www.terasrl.it