Platone

PLATFORM FOR OPERATION OF DISTRIBUTION NETWORKS

Advanced grid management for customer inclusion

Project overview Platone

Platone

Content

Platone in a nutshell

4 years
of project work

from 2019 until 2023

12 project partners

from Belgium, Germany, Greece and Italy

3 demonstrations

to test and demonstrate the Platone solutions

9 600 957,58 €

budget in general

7 535 148,02 €

EU contribution

Platone vision

- The world envisioned by PLATONE will provide a seamless integration of operation and market simplifying the life of customers, distribution grid operator and aggregators
- This is accomplished through to a multilayer platform architecture collecting data on the edge and delivering secure information both to Distribution Management Systems and to an open Marketplace for service provision

Platone objectives

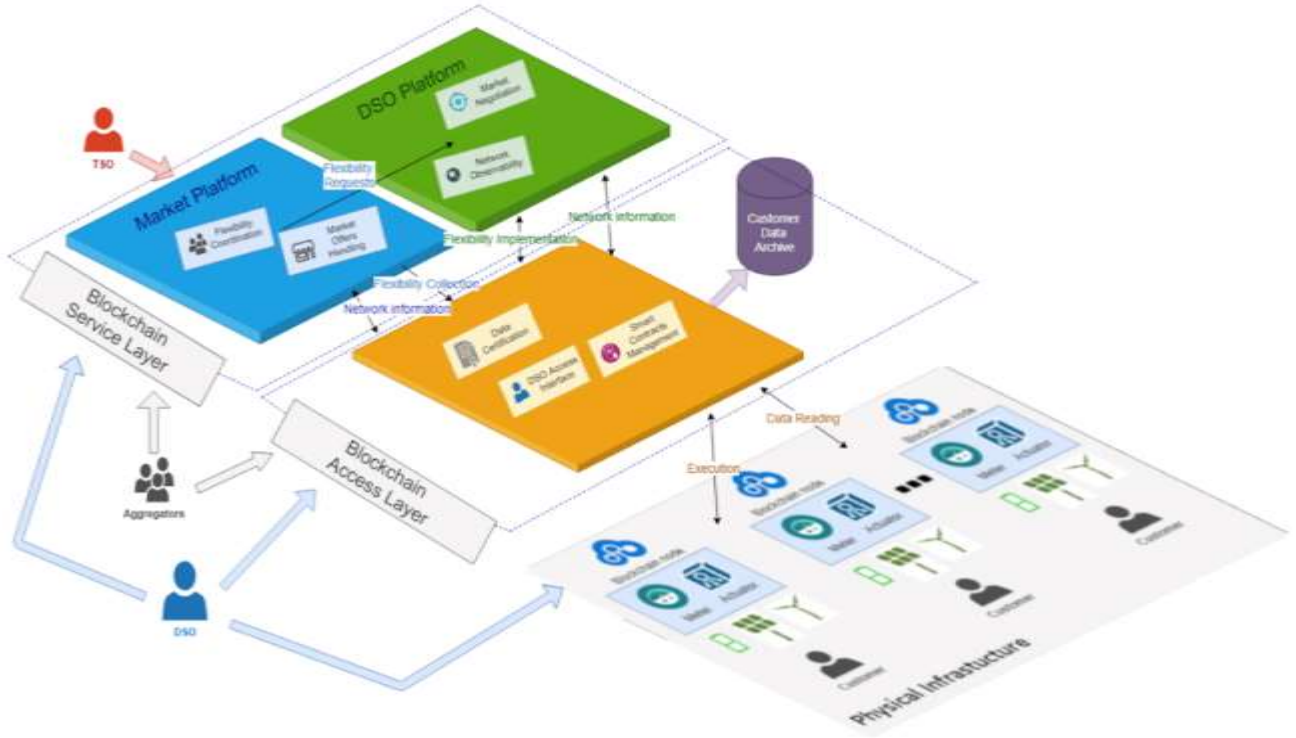
- Platone Strategic Challenge
  - Platone will address the growing needs of DSO's to have **real-time insight** into the operation of their networks while unlocking new flexibility markets in a fair and open way.
  - Main goal is to provide a **cost-effective** and **seamless, secure** power supply for their customers as active players while supporting the TSO in their system level responsibilities

Platone goals, objectives

- Platone Strategic Objective
  - Platone will develop a two-layer platform for distribution network operation and market operation creating a seamless integration of local prosumers in an open market structure

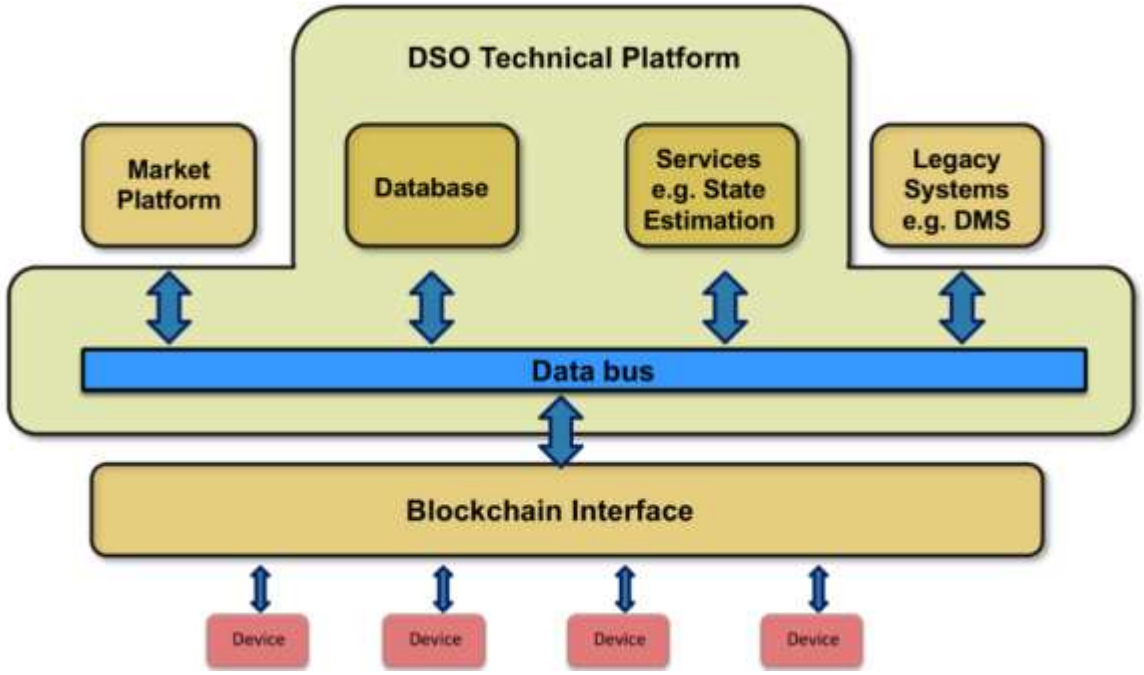
Open Source and dual use of data as key ingredient of an open platform

- Architectural proposal of H2020 Platone
  - Multi-layered hybrid IoT/off chain vs DLT/Blockchain/Smart Contract to enable:
    - Consumer access layer
    - Optimal coordination and operation of fair and transparent multi-stakeholder marketplaces
  - Dual use of data for market and technical services
  - Integration of legacy solutions



Putting all together to overcome limits of legacy solutions

- Combining the solutions envisioned in the previous architecture, here we have:
  - Secure data link thanks to blockchain
  - Integration of legacy DMS
  - Link to market for dual use of data
  - Integrated data bus for flexible integration of new services



Platone field and tests and simulation

Germany

Balancing between local
and higher-level network

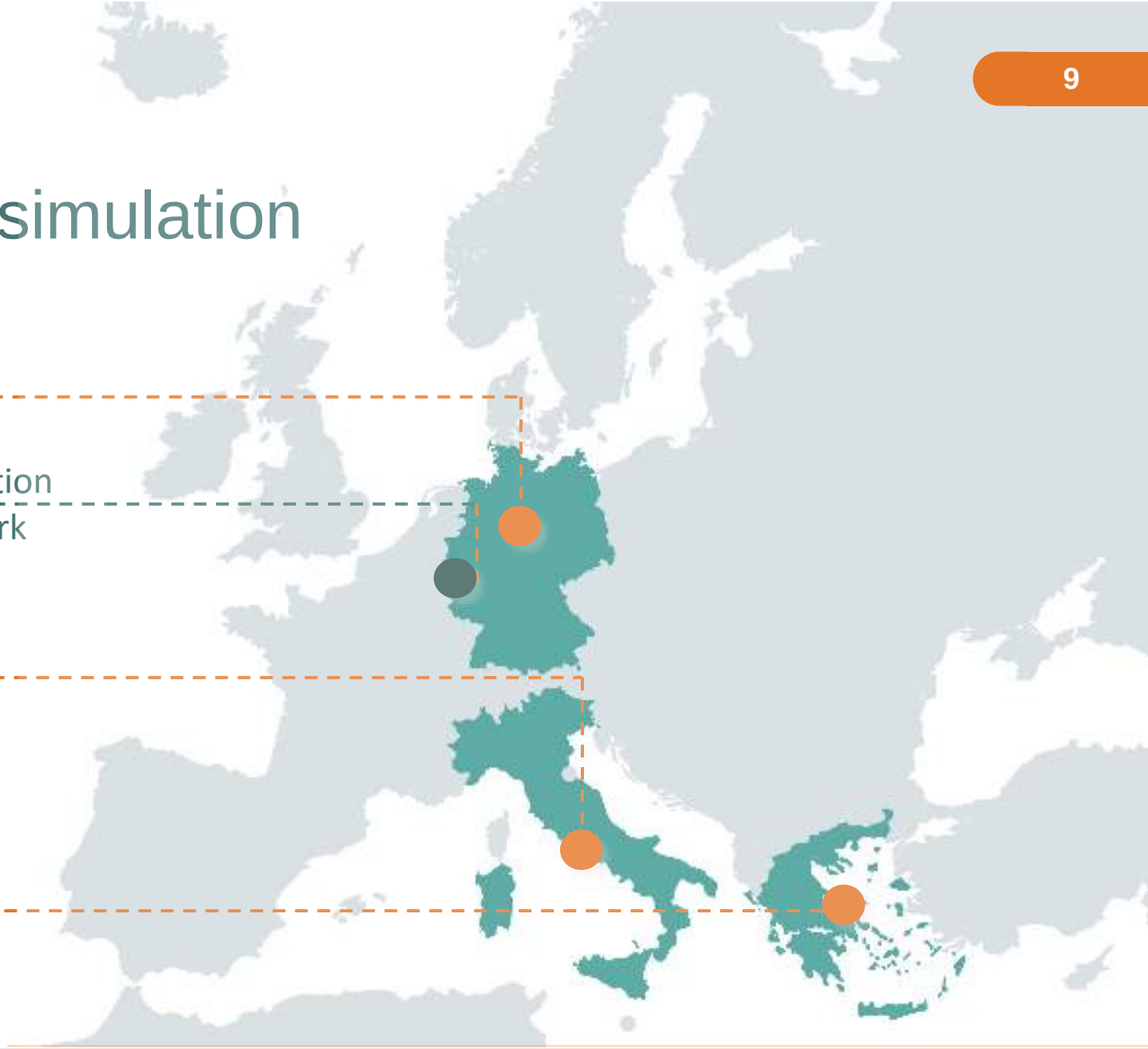
Reference implementation
and higher-level network

Italy

Cutting barriers,
unlocking flexibility

Greece

Innovative flexibility services and advanced
network observability



Platone field and tests and simulation

Twistringen (AVACON)

Maximization of consumption of local generation
Decoupling LV and MV instantaneous powers
Coordination of local balancing with external flexibility requests

Lab Germany (RWTH)

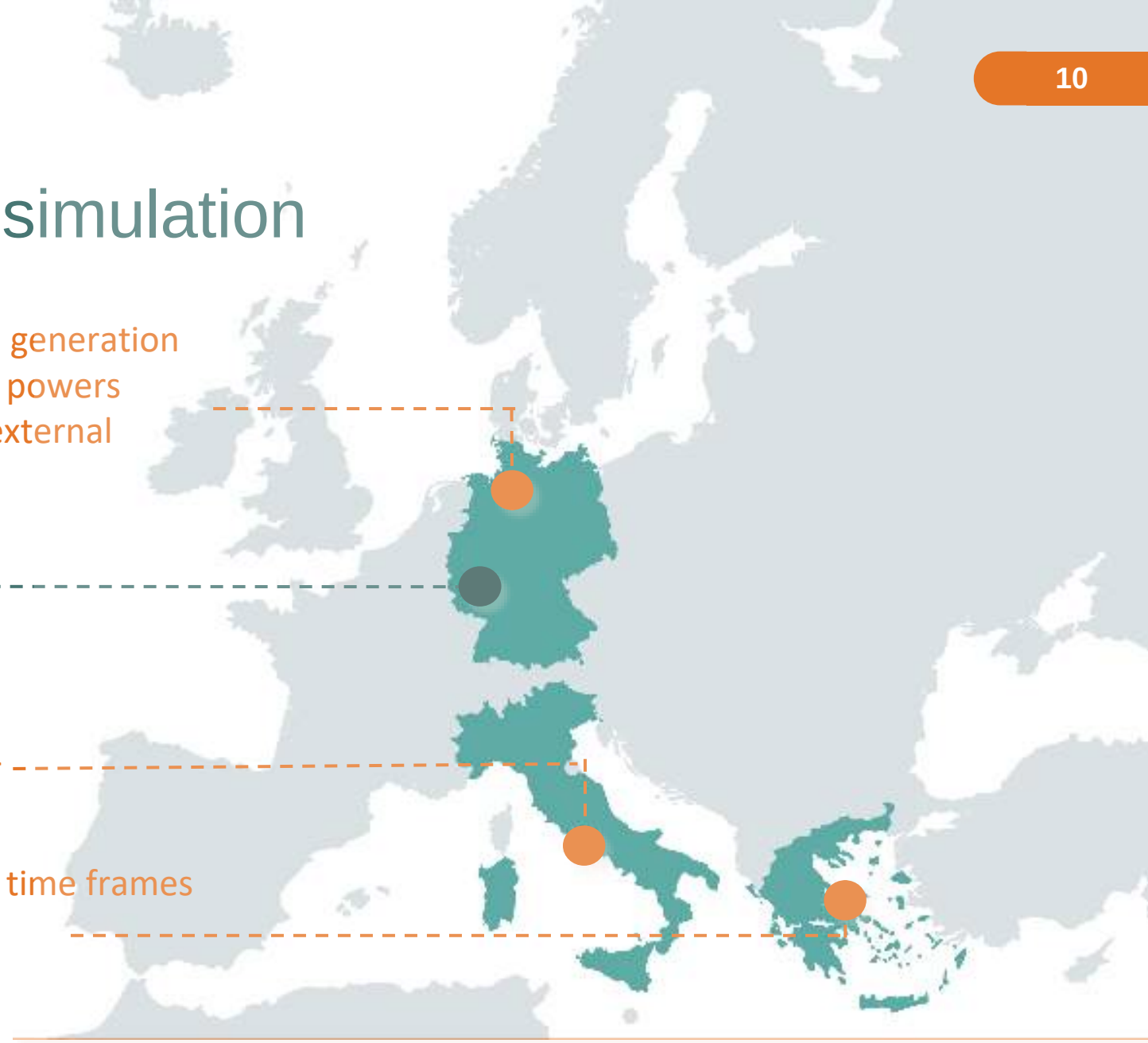
Reference implementation

Rome (areti)

"End-to-end flexibility market"
Real-time TSO-DSO cooperation for customer inclusion

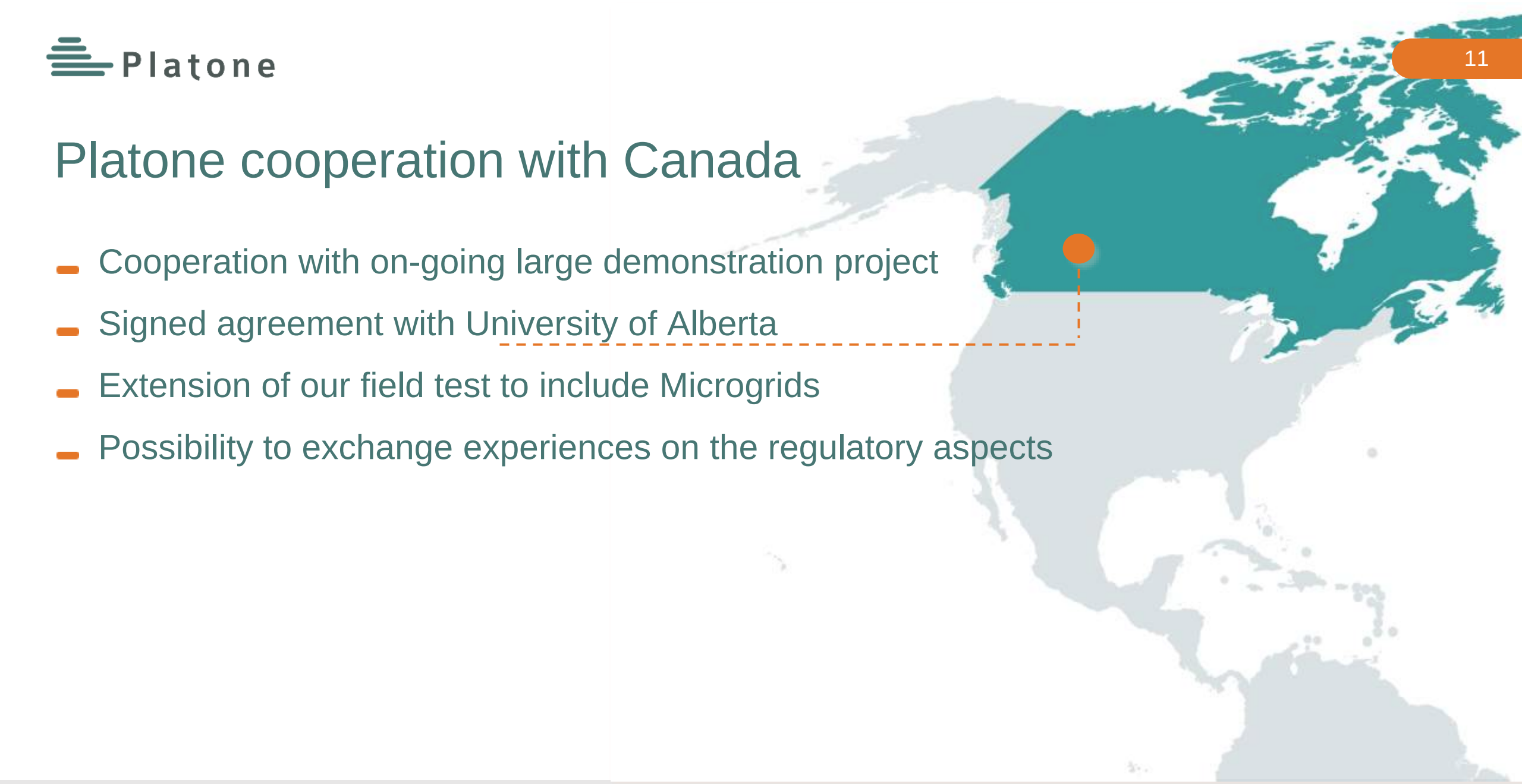
Mesogeia (HEDNO)

Optimal operation of DERs in DA & RT market time frames
Advanced grid state observability, situational awareness and self-healing



Platone cooperation with Canada

- Cooperation with on-going large demonstration project
- Signed agreement with University of Alberta
- Extension of our field test to include Microgrids
- Possibility to exchange experiences on the regulatory aspects



Platone and BRIDGE

- Platone is very active in the BRIDGE cooperation group of Smart Grid, Energy Storage, Island and Digitalisation H2020 projects
- Two main activities are worth mentioning:
  - Platone Consortium Partner areti: Coordinating Lead of the work related to HEMRM (*Harmonised Electricity Market Role Model*)
  - Platone Consortium Partner RWTH: Methodology for use-case inclusion and repository development

Balancing between local & higher-level network

German Platone demonstration

The German demo aims to establish an Energy Community and prove its ability to integrate with innovative distribution network operating strategies that increase the hosting capacity and efficiency of distribution networks.

Energy communities of the future

The system values

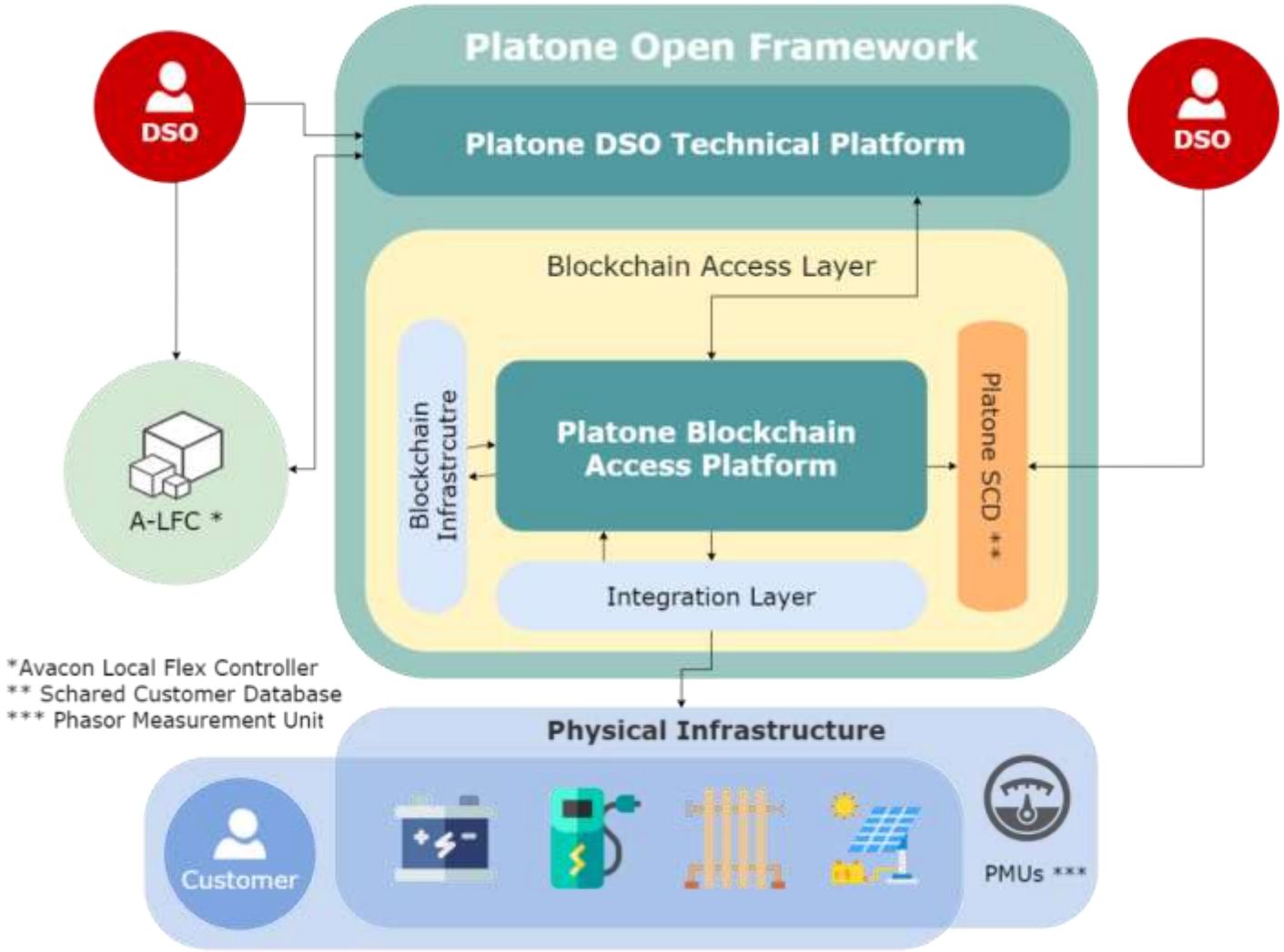
- local balancing up to islanding
- flexibility provision at demand
- energy delivery and energy export in bulks

The motivation

- to simulate generation and consumption behaviour of future energy communities and their physical effect on distribution network
- to ensure reliable and secure power supplies in the context of increasing DER penetration
- to gain near real-time insight into the operation of the networks and to improve grid operation through advanced observability approach
- to improve customers engagement and facilitate their participation in mechanisms for flexibility provision

The plan

- monitoring and forecasting of generation and demand of the community
- controlling the energy resources located within the community
- maximizing the consumption of locally generated energy & minimizing the demand satisfied by the public grid
- enabling the community to provide a fixed amount of power
- enabling the community to avoid power exchange along the mv/lv feeder (virtual islanding)
- enabling planned in advance energy supply in bulks and delayed in time export of generated surplus in bulks


Platone Open Framework
DSO
Platone DSO Technical Platform
DSO
Blockchain Access Layer
A-LFC *
Blockchain Infrastrcutre
Platone Blockchain Access Platform
Platone SCD **
Integration Layer
*Avacon Local Flex Controller
** Schared Customer Database
*** Phasor Measurement Unit
Physical Infrastructure
Customer
PMUs ***

The features

User

- Combining surrounding buildings to offer flexibility
- Reduce energy consumption on community level

Grid

- Increase share of renewable energy on total consumption
- Energy consumption, generation forecast
- Power consumption, generation forecast
- Demand-Response service
- Peak Shaving on Community Level/power limitation

The business modell

- community energy management
- peak shaving
- providing flexibility to markets or TSO, DSO for grid stabilisation
- provision of flexibility to DSO or DSO for increasing the hosting capacity and efficiency of existing networks
- increase efficiency and reliability of energy supply in future grids with increasing share of renewables and flexible loads

The KPI definition

- reduction of energy demand provided by mv-grid
- reduction of power recuperation peaks
- increase of self-consumption
- maximization of islanding duration
- flexibility effectiveness
- responsiveness
- accuracy of the achievement of a given setpoint
- participants' recruitment
- active participation
- forecast reliability – customer profile
- forecast reliability – grid profile
- distribution network hosting capacity
- success of package-based energy provision
- accuracy in forecasting deficits

Cutting barriers, unlocking flexibility

Italian Platone demonstration

The Italian demo aims to include all the customers connected to the distribution grid managed by areti, to provide ancillary services to the electrical system, creating a new local energy flexibility market based on the trust and certification of the transactions.

Cutting barriers, unlocking flexibility

The system values

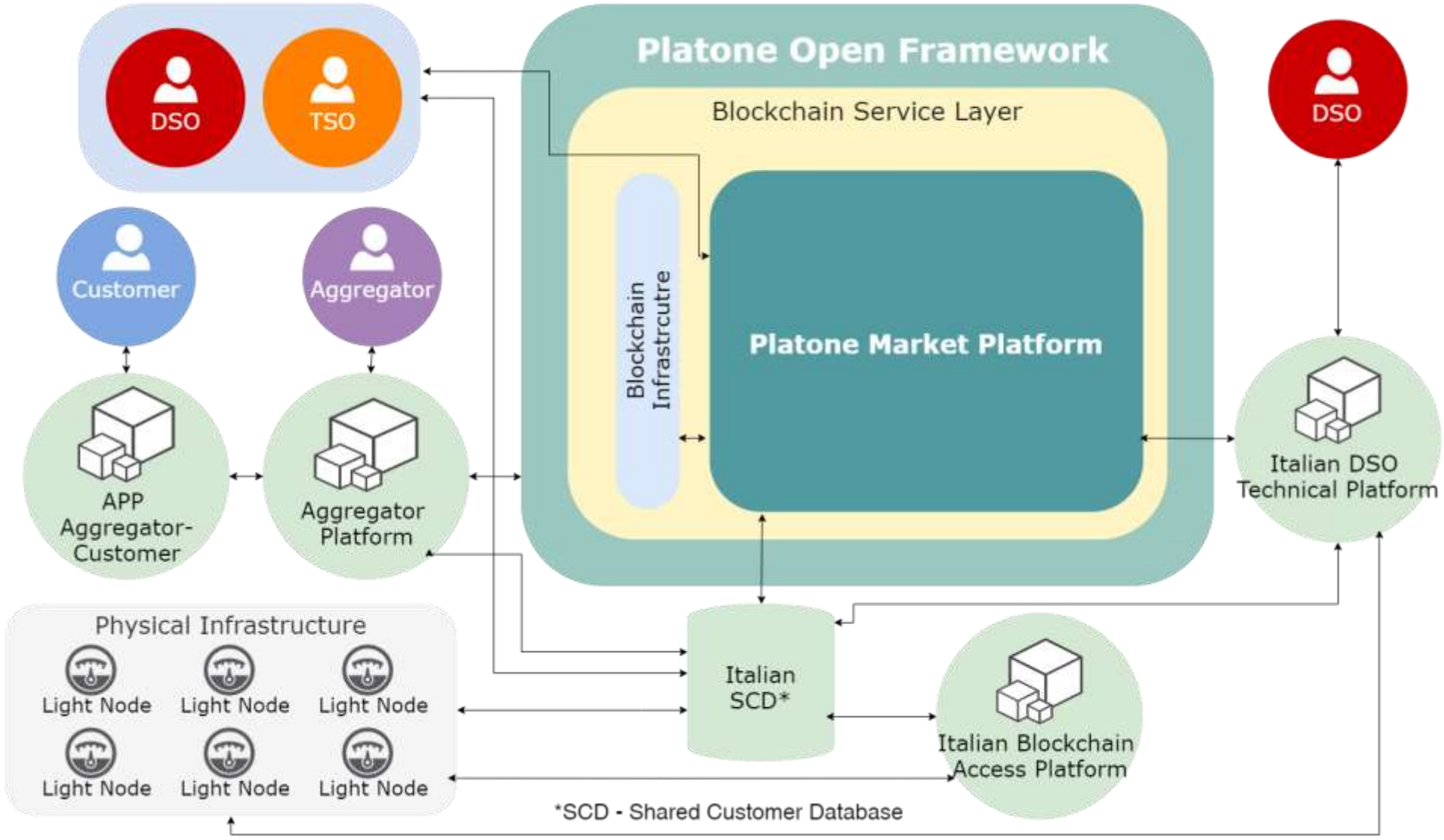
- enabling the medium voltage and mainly low voltage resources
- use of an innovative device: the light node
- blockchain technology
- common TSO-DSO flexibility market
- market – based approach

The motivation

- to ensure reliable and secure power supplies in the context of increasing der penetration.
- to improve grid operation through advanced observability approach.
- to unlock local flexibility markets to solve congestions and voltage stability issues.
- to improve customers engagement and enable their fair participation in the market.
- to increase the revenues of the customers and decrease the systems costs.
- to increase the trust in the market exchanges

The plan

- supporting the TSO in using flexibility provided by the resources connected to the distribution network
- ensuring an inclusive and non-discriminatory access to the market to all the actors that provide grid services
- empowering coordination between system operators
- activating flexibility to solve voltage violations and congestion issues in the distribution grid
- sharing flexibility data with all stakeholders
- certifying the data for the market exchanges with blockchain technology


DSO
TSO
Platone Open Framework
Blockchain Service Layer
Blockchain Infrastrcutre
Platone Market Platform
DSO
Customer
Aggregator
APP Aggregator-Customer
Aggregator Platform
Italian DSO Technical Platform
Physical Infrastructure
Light Node
Light Node
Light Node
Light Node
Light Node
Light Node
Italian SCD*
Italian Blockchain Access Platform
*SCD - Shared Customer Database

The features

User

- optimization of the energy price
- interaction with the aggregator via app
- participation in a local community

Grid

- generation and load forecast
- real time topology update
- medium voltage and low voltage observability
- flexibility enabler of the end-users
- increase the percentage of DER in the system

The Business Modell

- principal buyers of flexibility: DSO, TSO
- principal provider for flexibility: aggregator
- flexibility intermediary: independent market operator
- intermediation model: market based

The Business Modell

Pilot

- focus on the flexibility provided in medium and in low voltage, using a multi-platform approach
- an access layer, based on blockchain, is used to involve the customers into market
- a common repository, named shared Customer Database, for all flexibility data is accessible to the stakeholders
- a market platform is used to matches the SOs requests and aggregators offers, and also to performs on the Blockchain service layer the settlement phase

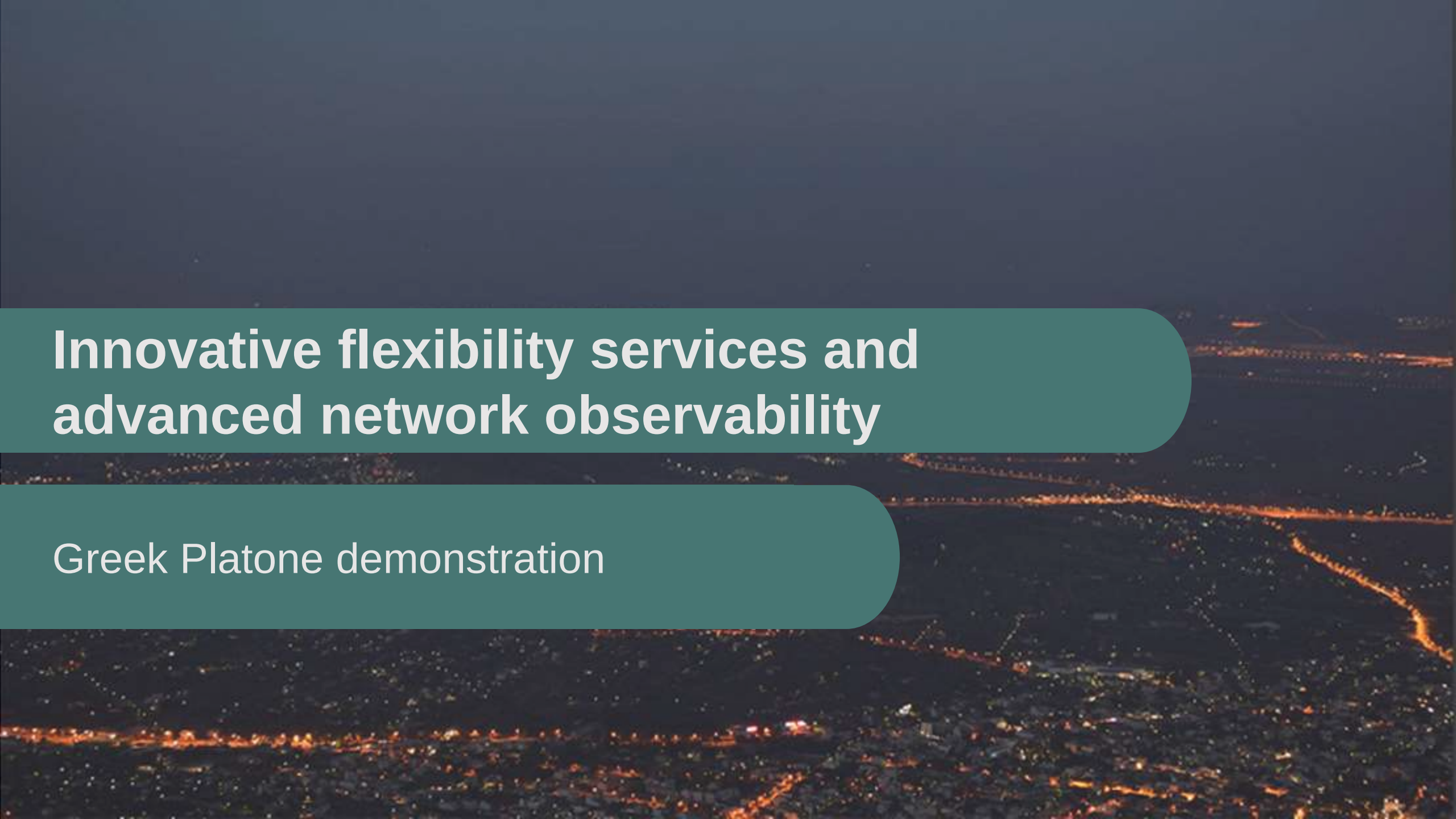
The Business Modell

Demo

- tests two new roles for the DSO as buyer and enabler of local flexibility
- unlocks the user potential installing a device able to transmit the setpoint and relieves the real time measurements

The KPI Definition

- participant's recruitment
- active participation
- flexibility availability
- flexibility effectiveness
- forecast reliability – customer profile
- forecast reliability – grid profile
- market liquidity



Innovative flexibility services and advanced network observability

Greek Platone demonstration

The Greek demo aims at developing state estimation techniques for near real-time grid monitoring purposes; and investigating whether the novel approach of a variable network tariff would incentivise customers with flexible loads so that the optimal dispatch for the distribution network is achieved.

Towards near real-time view of the network and optimal dispatching

The system values

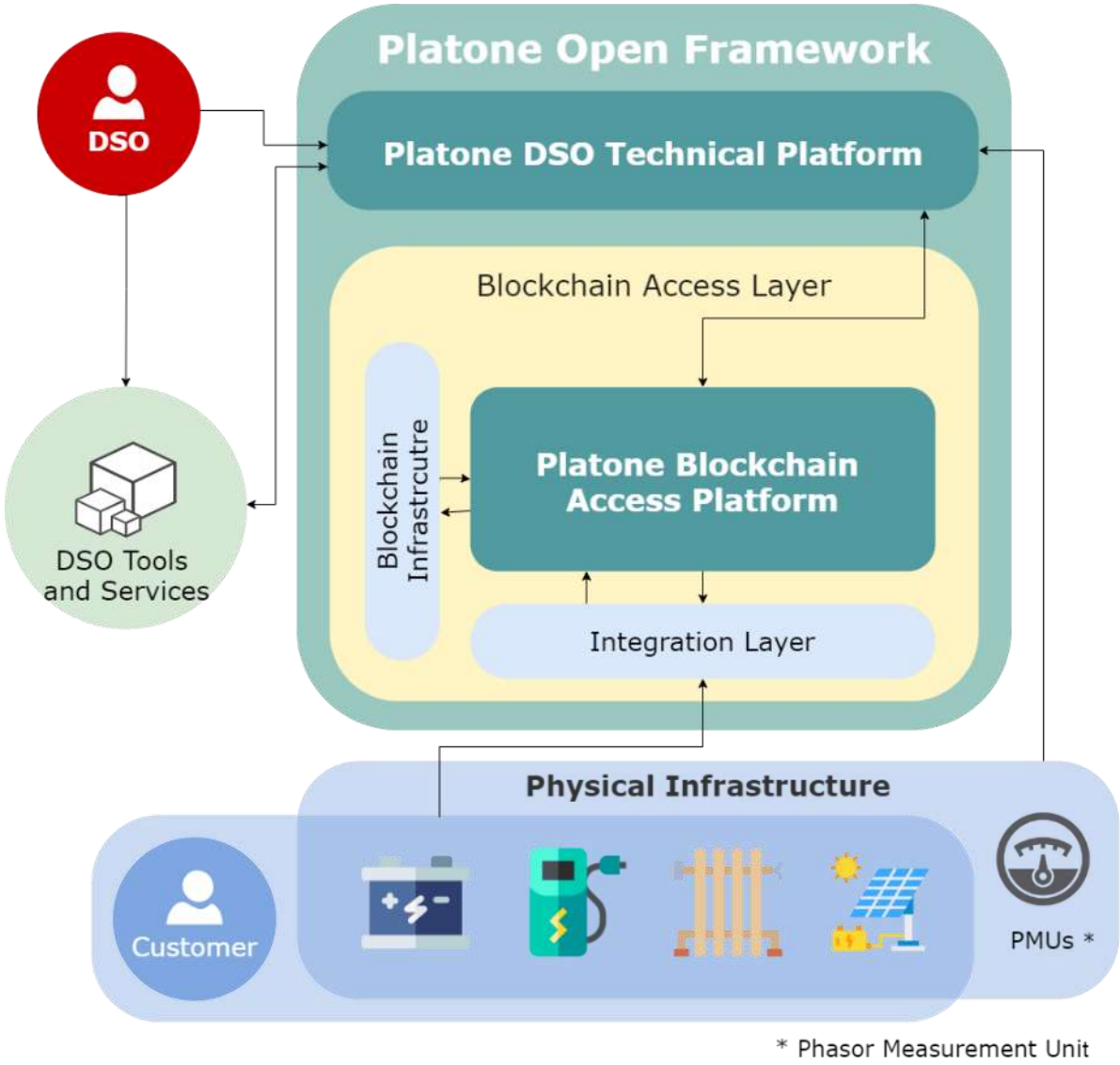
- State Estimation techniques
- Phasor Measurement Units (PMUs)
- Variable Network Tariffs
- Optimal dispatch

The motivation

- To ensure reliable and secure power supplies in the context of increasing DER penetration.
- To gain near real-time insight into the operation of the networks and to improve grid operation through advanced observability approach.
- To investigate potential provision of ancillary services to the TSO by the users of the distribution network.
- To achieve optimal dispatching addressing local congestion and voltage level issues using novel approaches for flexibility mechanisms at DSO level.
- To assess the penetration limits of DERs for the better control and planning of the distribution network.

The plan

- Developing state estimation techniques for near real-time grid monitoring purposes.
- Ensuring smooth incorporation of synchronised measurement data derived from PMUs into the pre-existing system of conventional measurements.
- Investigating if the novel approach of a variable network tariff, instead of the traditional flat network tariff, incentivises customers with flexible loads and leads to optimal dispatch for the distribution network.
- Exploring the potential of the users of the distribution network to respond adequately to TSO’s request for frequency restoration reserve activation.


Platone Open Framework
DSO
Platone DSO Technical Platform
Blockchain Access Layer
Blockchain Infrastrcutre
Platone Blockchain Access Platform
Integration Layer
DSO Tools and Services
Physical Infrastructure
Customer
PMUs *
* Phasor Measurement Unit

The features

GRID

- Grid observability
- Data visualization
- Variable network tariffs (DA, balancing market)
- Handling TSO’s requests
- State estimation
- Optimal DER dispatch
- Integration of different grid data
- Load shifting

The Business Modell

- Principal stakeholders for flexibility: DSO, TSO, DERs, Customers, Prosumers
- Intermediation model: Network Tariff based
- Benefits for stakeholders

The Business Modell

Customers/Prosumers/DERs

- Financial gain by modifying energy consumption/production patterns

TSO

- Frequency support request provided by the DSO

The Business Modell

DSO

- Peak shaving/Load shifting: Optimised grid utilization due to change in customers'/prosumers' behaviour, less stress on equipment, reduced need for infrastructure upgrades/decreased maintenance costs
- Optimised DER integration- Increase of the Distribution Network hosting capacity
- Increased system reliability due to advanced grid observability

The KPI Definition

- Relative root mean square/ percentage error
- Accuracy metric for complex phasor voltage estimation
- Convergence metric in terms of objective function/ estimated voltage magnitude/ estimated voltage angle
- Generation / Demand curtailment
- Generation / Demand curtailment occurrences
- Network limit violation occurrences
- Frequency support not provided
- PMUs field installation and integration
- Data visualization
- Visualized outputs of tools and services and network response handling

Platone

PLATFORM FOR OPERATION
OF DISTRIBUTION NETWORKS

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