Platone

PLATform for Operation of distribution NEtworks

D2.4
PlatOne Market Platform (v2)

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Abstract

The Platone Open Framework aims to create an open, flexible, and secure system that enables distribution grid flexibility/congestion management mechanisms, through innovative energy market models involving all the possible actors at many levels (DSOs, TSOs, customers, aggregators). The Platone Framework is an open-source framework based on blockchain technology that enables a secure and shared data management system, allows standard and flexible integration of external solutions (e.g., legacy solutions), and is open to integration of external services through standardized open application program interfaces (APIs).

This document accompanies the second software delivery of the Platone Market Platform and extends it with an architecture overview, updates on the functionalities, technical specifications and deployment guidelines.

The Platone Market Platform is part of the Platone Open Framework that is integrated, tested and evaluated in three different demo sites in: Greece, Germany and Italy. Each of these demo sites integrate different parts of the framework.

In particular, the second prototype of the Platone Market Platform is integrated, tested and evaluated in the Italian Demo Site Architecture.

Keyword list

Platone Market Platform, Flexibility Market, Blockchain Service Layer, Smart Contracts, Settlement, Ethereum

Executive Summary

Innovation for the customers, innovation for the grid" is the vision of project Platone - Platform for Operation of distribution Networks. Within the H2020 programme "A single, smart European electricity grid", Platone addresses the topic "Flexibility and retail market options for the distribution grid". Modern power grids are moving away from centralised, infrastructure-heavy transmission system operators (TSOs) towards distribution system operators (DSOs) that are flexible and more capable of managing diverse renewable energy sources. DSOs require new ways of managing the increased number of producers, end users and more volatile power distribution systems of the future.

Platone is using blockchain technology to build the Platone Open Framework to meet the needs of modern DSO power systems, including data management. The Platone Open Framework aims to create an open, flexible and secure system that enables distribution grid flexibility/congestion management mechanisms, through innovative energy market models involving all the possible actors at many levels (DSOs, TSOs, customers, aggregators). It is an open source framework based on blockchain technology that enables a secure and shared data management system, allows standard and flexible integration of external solutions (e.g. legacy solutions), and is open to integration of external services through standardized open application program interfaces (APIs). It is built with existing regulations in mind and will allow small power producers to be easily certified so that they can sell excess energy back to the grid. The Platone Open Framework will also incorporate an open-market system to link with traditional TSOs. The Platone Open Framework will be tested in three European demos and within the Canadian Distributed Energy Management Initiative (DEMI).

The **Platone Market Platform** is one of the core components of the Platone Open Framework. It is a blockchain-based platform that enables the management of wide geographical area flexibility requests from TSOs and local flexibility requests from DSOs. The flexibility requests are matched with offers coming from aggregators, thus resolving conflicts according to predefined rules of dispatching priorities. All the market operations are registered and certified within the blockchain service layer, ensuring a higher level of transparency, security and trustworthiness among all the market players.

Furthermore, the Platone Market Platform enable an innovative incentivisation mechanism for customers engagement based on blockchain technology, smart contracts, and tokenisation.

While the first prototype of the Platone Market Platform focused on the management of the Flexibility Day Ahead Market, defining all the necessary data models and implementing all the core services and components, the second version of the Platone Market Platform concluded the implementation of all the functional and non-functional requirements expected.

More in detail, this second version includes the management of integrated Day-Ahead and Intra-Day market sessions, as well as a complete integration with the blockchain service layer for the certification of the market data results and for the tokenisation of the settlement phase for the end-customer.

Authors and Reviewers

Main responsible		
Partner	**Name**	**E-mail**
ENG		
	Ferdinando Bosco	Ferdinando.bosco@eng.it
Author(s)/contributor(s)		
Partner	**Name**	
ENG		
	Vincenzo Croce	Vincenzo.croce@eng.it
	Angelo Triveri	Angelo.Triveri@eng.it
Reviewer(s)		
Partner	**Name**	
Areti		
	Gabriele Fedele	Gabriele.Fedele@areti.it
	Antonio Vito Mantineo	AntonioVito.Mantineo@areti.it
	Olivia Cicala	Olivia.Cicala@areti.it
EDSO		
	Selene Liverani	Selene.liverani@edsoforsmartgrids.eu
Approver(s)		
Partner	**Name**	
RWTH		
	Amir Ahmadifar	aahmadifar@eonerc.rwth-aachen.de

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1 Introduction

The project "PLATform for Operation of distribution Networks – Platone" aims to develop an architecture for testing and implementing a data acquisition system based on a two-layer Blockchain approach: an "Access Layer" to connect customers to the Distribution System Operator (DSO) and a "Service Layer" to link customers and DSO to the Flexibility Market environment (Market Place, Aggregators, …). The two layers are linked by a Shared Customer Database, containing all the data certified by Blockchain and made available to all the relevant stakeholders of the two layers. This Platone Open Framework architecture allows a greater stakeholder involvement and enables an efficient and smart network management. The tools used for this purpose will be based on platforms able to receive data from different sources, such as weather forecasting systems or distributed smart devices spread all over the urban area. These platforms, by talking to each other and exchanging data, will allow collecting and elaborating information useful for DSOs, transmission system operators (TSOs), Market, customers and aggregators. In particular, the DSOs will invest in a standard, open, non-discriminatory, blockchain-based, economic dispute settlement infrastructure, to give to both the customers and to the aggregator the possibility to more easily become flexibility market players. This solution will allow the DSO to acquire a new role as a market enabler for end users and a smarter observer of the distribution network. By defining this innovative two-layer architecture, Platone strongly contributes to aims to removing technical and economic barriers to the achievement of a carbon-free society by 2050 [1], creating the ecosystem for new market mechanisms for a rapid roll out among DSOs and for a large involvement of customers in the active management of grids and in the flexibility markets. The Platone platform will be tested in three European demos (Greece, Germany and Italy) and within the Distributed Energy Management Initiative (DEMI) in Canada. The Platone consortium aims to go for a commercial exploitation of the results after the project is finished. Within the H2020 programme "A single, smart European electricity grid" Platone addresses the topic "Flexibility and retail market options for the distribution grid".

The Platone solution consists of a two-layer blockchain architecture named Platone Open Framework that consists of a series of core components, including the Platone Market Platform.

The main goal of the Platone Market Platform is to enable a secure and transparent Flexibility Market, exploiting blockchain technology and smart contracts, for handling the management of flexibility services, providing market results to all the stakeholders, validating the flexibility provisioning, and performing the settlement outcome with an innovative incentivisation mechanism for improving customer engagement.

The Platone Market Platform has been implemented following the specifications and requirements gathered in the first phase of the project and is delivered in three different incremental versions.

The first version of the Platone Market Platform was already tested and successfully integrated in the Platone Italian demo site. The feedback collected and the implementation of expected requirements, conducted to the implementation of the second prototype, fully functional and ready to be integrated in the intermediate version of the Platone Open Framework.

1.1 Task 2.2

This deliverable is related to the Task 2.2 [2] that aims at the implementation of the Platone Market Platform, following the functional and non-functional requirements defined in D2.1 [3] and in D2.2 [4].

The Task 2.2 foresees three different releases of the Platone Market Platform.

1.2 Objectives of the Work Reported in this Deliverable

The objective of this deliverable is to present the second prototype of the Platone Market Platform and its realization following the technical specification and requirements expected. The Platone Description of Action defines this deliverable as a demonstrator. This document accompanies the code repository with a more detailed architecture description as well as some extended deployment instructions for deploying, testing and integrating the platform. It also reports all the updates with respect to the first version of the platform.

1.3   Outline of the Deliverable

Chapter 2 of this document describes the second realization of the Platone Market Platform according to the updated specification provided in Deliverable D2.2 and discusses the new functionalities implemented. It also provides a mapping with the expected functional and non-functional requirements. Chapter 3 provides the updated interfaces and communication mechanisms. Chapter 4 delivers a list of languages, technologies and external tools used throughout the platform. Chapter 5 is closely linked to the software delivery and provides detailed installation, setup, and configuration instructions. Finally, Chapter 6 concludes this deliverable.

1.4   How to Read this Document

The document aims to give an overview to the Platone Market Platform second prototype release. A description of the foreseen functional and non-functional requirements expected can be found in D2.1 and D2.2. As this document presents an update with respect to the previous version, it is strongly recommended to refer to D2.3 [5] for an exhaustive description of the Platone Market Platform. Nonetheless, for the convenience of the reader, some important information already reported in D2.3 is also reported in this document.

2 Platone Market Platform Architecture (v2)

2.1 Architecture

The Platone Market Platform consists of a three-layer architecture:

- **UI Layer** includes a web dashboard that allows market players (DSOs, TSOs and aggregators) to manage their own market operations and Market Operator to handle all the Market Platform features
- **Services Layer** provides the business logic, including the market-clearing tool, the flexibility services, the settlement services and smart contract services
- **Data Layer** provides the management of the market data and the registration of the market operations within the blockchain infrastructure.

The **communication layer** allows the integration of external components and internal communication among the different layers within the Market Platform. It provides both synchronous communication interfaces (REST APIs) and asynchronous communication interfaces (Message Broker).

The **blockchain service layer** consists of a blockchain infrastructure, based on Ethereum blockchain nodes, which enables the deployment of Smart Contracts.

The Market Platform architecture was not updated for the second implementation phase, which focused on the implementation of new functionalities without the necessity to update the consolidated architecture. The first version is shown in Figure 1. For more details on the different layers please refer to the D2.3 [5].
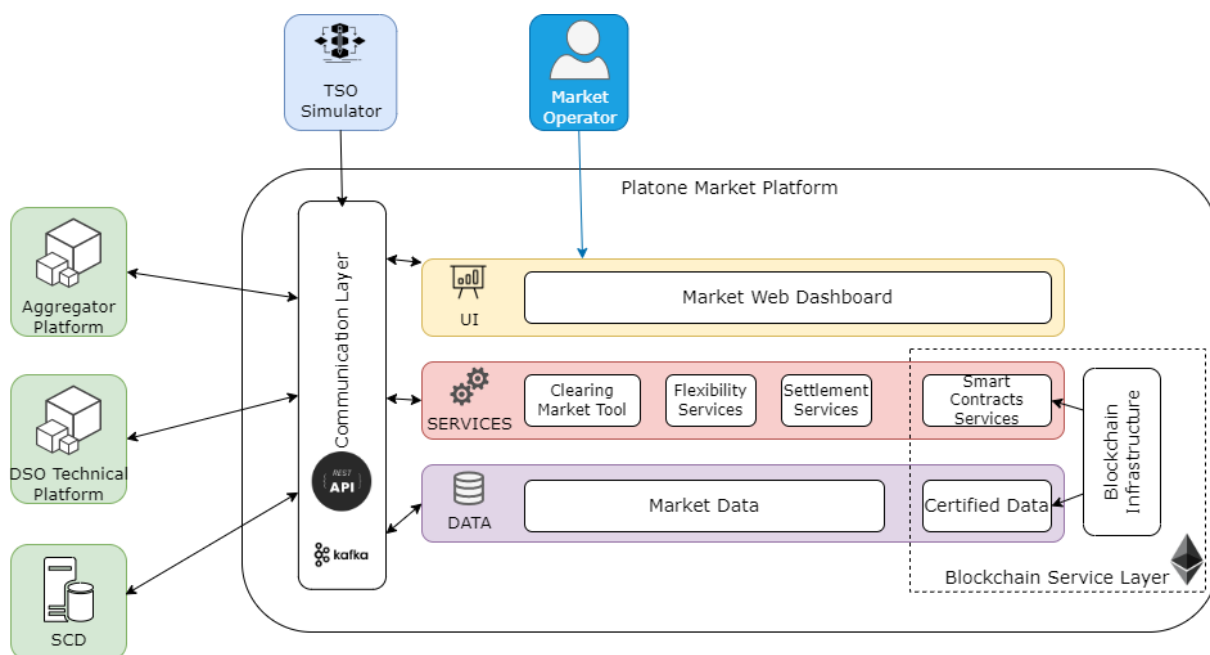

Figure 1: Platone Market Platform Architecture

2.2 Functionalities

The first version of the Platone Market Platform implemented a subset of the expected functionalities (see D2.3).

The second prototype of the Platone Market Platform focused on the consolidation of the existing functionalities and the implementation of the complete list of the expected functional and non-functional requirements, in order to have a fully functional platform, ready to be tested and evaluated within the demo sites architecture.

In particular, the following functionalities were implemented in the second prototype:

- Implementation of intra-day market completely integrated with Day-Ahead one and the possibility to create new request and offers from SOs and Aggregators
- Settlement Outcomes and validation based on blockchain technology and including contract agreement between aggregator and customer and tokenization mechanism for the end users. The tokenisation mechanism is completely integrated with the end-customer mobile app (App Flessibili).
- Data Certification for all the market result on blockchain infrastructure
- Extended version of the Web Dashboard for Market Participants

2.2.1 Day-Ahead and Intra-Day Market

The first version of the Platone Market Platform successfully implemented the Day Ahead market sessions.

The second version of the platform is able to manage in an integrated way both Day Ahead and Intra Day market sessions. The Day Ahead sessions consist of 1 session related to services to be delivered in the 24 hours of the day after, while the Intra Day sessions consists of 6 different sessions each one related to services to be delivered in the next 4 hours.

The following Figure 2 [6] reports the market sessions implementation in the Italian Demo Flexibility Market. It shows a complete list of processes and related time windows, also indicating the related activities of the other platforms included in the Italian demo architecture.
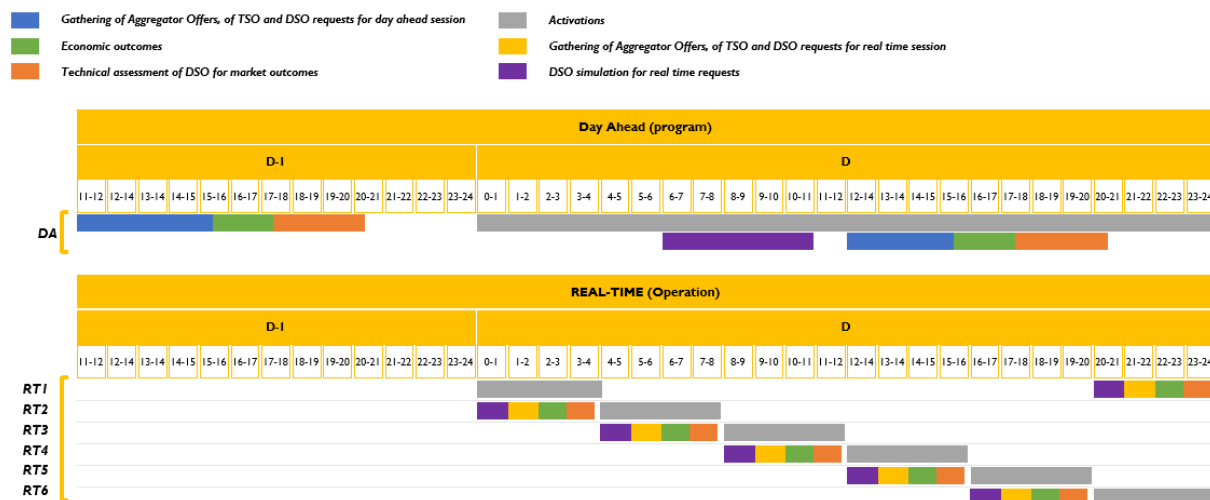

Figure 2: Market Sessions processes and timing [6]

2.2.2 Blockchain services – Settlement and Data Certification

In order to validate the flexibility provided by the resources, the Market Platform acquires the certified measurements from the Shared Customer Database and performs the settlement at the end of any intra-day session.

The Platone Market Platform is able to calculate the settlement for each resource and to enable the remuneration process through the Smart Contract and Platone Tokens, using Smart Contracts.

The second version of the Platone Market Platform includes the integration with the blockchain infrastructure and the Blockchain Service Layer.

More in detail, the second version of the Platone Market Platform implements three different Smart Contracts:

- **Certification**, the Smart Contract can certificate all the market results and register them into the blockchain infrastructure.
- **Settlement Agreement**, a dynamic smart contract able to manage multiple agreements between the Aggregator and its own customers. This Smart Contract is used for the settlement management.
- **Platone Token**, an ERC-20 based Token is used for the payment of the flexibility provisioning to the end customers. Each customer has its own wallet linked to its own Point of Delivery (PoD) and Platone Tokens are provided to the customer wallet at the end of the settlement phase.

2.2.3 Extended Version of the Platone Web Dashboard

The updated version of the Platone Market Platform Dashboard includes the following features:

- **Day-Ahead and Intra-Day** sessions management
- **Filtering tab** with the possibility to filter the market sessions for specific date or text (type, status, etc…)
- **Download Button**, for allowing to download in a csv format any kind of market data (requests, offers, market outcomes and validated outcomes)

2.3 Data Models

Almost all the necessary data models for the basic functionalities of the Platone Market Platform were already defined and implemented in the first version (see D2.3).

The second version includes some new data models and updates some existing ones for managing the new features implemented.

2.3.1 New data models

Certification

Table 1: Certification Model

Field	Type	Description
hashedData	String	**Required.** Hash of the certified market result
owner	String	**Required.** The owner of the data. In this case, the Market Operator
createdAt	Date	Creation date
transactionHash	String	**Required.** The reference to the transaction in the blockchain infrastructure.

Wallet

Table 2: Wallet model

Field	Type	Description
id_wallet	String	**Required. Unique.** Address of the wallet

| balance | String | **Required.** Total amount of the wallet (aligned with the blockchain wallet) |

2.3.2 Updated data models

The following data models were updated in the second version.

PoD

The updated version of the PoD includes the reference with the blockchain wallet. All other fields are unchanged. The new data model is reported below.

<div align="center">Table 3: PoD model</div>

Field	Type	Description
podId	String	**Required,** pod identification string
aggregatorId	String	**Required,** aggregator identification string
zone	String	PoD geographic area
pomId	String	PoM identification string
pnp	Number	Active Power Withdrawn in kW
inp	Number	Active Power Feed in kW
inq	Number	Inductive Reactive Power in kVar
cnq	Number	Capacitive Reactive Power in kVar
sendTime	Date	Sending data Timestamp- format ISO-8601: YYYY-MM-DDThh:mm:ss[.mmm]TZD
validityStart	Date	Validity Date - format ISO-8601: YYYY-MM-DDThh:mm:ss[.mmm]TZD
flexibilityType	String	Type of flexibility offered ["continue", "discrete"]
actionType	String	Type of allowed action ["activate","modify","delete"]
smartContractId	String	ID of the associated smart contract for settlement mechanism
powerCurvesDuration	Number	Curve duration in hours (**default** 24)
powerCurveInterval	Number	Curve interval in minutes (**default** 15)

powerBaselineCurves	**Errore. L'origine riferimento non è stata trovata.**	Typical POD power baseline
maxFlexibility	**Errore. L'origine riferimento non è stata trovata.**	Maximum flexibility
wallet	String	**Required. Unique.** The address of the blockchain wallet.

SmartContract

The updated version of the Smart Contract model includes only the reference with the blockchain smart contract. All other information is directly stored in the blockchain object.

Table 4: Smart Contract Model

Field	Type	Description
address	String	**Required** Address of the smart contract in the blockchain
owner	String	**Required** Address of the owner of the smart contract

Settlement

The new settlement object includes a "startTime" field for allowing the correct validation of the data and a "sent" field in order to check if the settlement result was successfully sent to the market players.

Table 5: Settlement Model

Field	Type	Description
marketOutcomeId	String	**Required** Id of the market outcome
marketType	String	Market Type : "dayAhead" || realTime"
flexibility	[**FlexibilitySettlementObject**]	**Required** It describes the flexibility settlement for each pod
startTime	Date	Starting date of the flexibility
sent	Boolean	True if the settlement was sent to the Aggregator

FlexibilitySettlementObject

Table 6: Flexibility Settlement Object Model

Field	Type	Description
pod	String	Id of the Pod
power	[**MeasuredPowerObject**]	Describes the measured power

MeasuredPowerObject

Table 7: Measured Power Object Model

Field	Type	Description
Index	String	Index of the interval in the time frame (e.g. from 0 to 95 in day-ahead market)
requestedP	Number	Active Power requested (in kW)
measuredP	Number	Active Power measured (in kW)
paidP	Number	Active power paid (in €)
penaltyP	Number	Active Power Penalty to be paid (in €)
requestedQ	Number	Reactive Power requested (in kVar)
measuredQ	Number	Reactive Power measured (in kVar)
paidQ	Number	Reactive power paid (in €)
penaltyQ	Number	Reactive Power Penalty to be paid (in €)
requestPlayerId	String	Id of the DSO or TSO that requests for flexibility
offerPlayerId	String	Id of the Aggregator

2.4 Mapping with Platform Requirements

Table 8 reports the list of functional and non-functional requirements expected for the Platone Market Platform. The second prototype of the Platone Market Platform is fully functional and satisfies all the expected requirements as listed in the D2.1 and D2.2.

Table 8: Platone Market Platform - Functional and Non-Functional Requirements

Requirement ID	Requirement name	Requirement description	Use Cases	Status	Notes
FR_MP_I_1	Initialisation	The Market Platform is able to receive PoDs information and PoM association from SCD in order to initialize a new market session	UC-IT-1 UC-IT-2	Completed	New in the second version
FR-MP-FSM-01	Flexibility Services Management	The Market Platform allows DSOs and TSOs to create flexibility requests in automatic way	UC-IT-1 UC-IT-2	Completed	
FR-MP-FSM-02	Flexibility Services Management	The Market Platform allows DSOs to create flexibility requests through UI	UC-IT-1 UC-IT-2	Cancelled	The creation of the market requests and offers is performed automatically from the external platforms (DSOTP and Aggregator Platform). UI is no longer required.
FR-MP-FSM-03	Flexibility Services Management	The Market Platform allows Aggregator Platform to create flexibility offers in automatic way	UC-IT-1 UC-IT-2	Completed	
FR-MP-FSM-04	Flexibility Services Management	The Market Platform acquires and stores all the flexibility requests and offers	UC-IT-1 UC-IT-2	Completed	
FR-MP-MOMV-01	Market Outcomes Matching and Validation	The Market Platform is able to match flexibility requests and offers through clearing market algorithms	UC-IT-1 UC-IT-2	Completed	
FR-MP-MOMV-02	Market Outcomes Matching and Validation	The Market Platform is able to provide the Market Outcomes (results of market clearing) to the DSO Technical Platform for the technical validation	UC-IT-1 UC-IT-2	Completed	

FR-MP-MOMV-03	Market Outcomes Matching and Validation	The Market Platform receives the validated market outcomes from DSO Technical Platform	UC-IT-1 UC-IT-2	Completed	
FR-MP-MOMV-04	Market Outcomes Matching and Validation	DSOs, TSOs and Aggregators receives Market Day Ahead outcomes from the Market Platform	UC-IT-1 UC-IT-2	Completed	
FR-MP-SA-01	Services activation	The Market Platform allows to DSOs and TSOs to create service activation requests in automatic way	UC-IT-1 UC-IT-2	Cancelled	The service activation is not responsibility of the Market Operator and cannot be performed into the Market Platform
FR-MP-SA-02	Services activation	The Market Platform allows to Market participant to create service activation requests through UI	UC-IT-1 UC-IT-2	Cancelled	The service activation is not responsibility of the Market Operator and cannot be performed into the Market Platform
FR-MP-SA-03	Services activation	The Market Platform is able to aggregate the service activation requests (from DSOs and TSOs) and provide them to all the other stakeholders	UC-IT-1 UC-IT-2	Cancelled	The service activation is not responsibility of the Market Operator and cannot be performed automatically into the Market Platform
FR-MP-BC-01	Blockchain certification	The Market Platform is able to register on the blockchain all the market data trough Smart Contracts based functionalities	UC-IT-1 UC-IT-2	Completed	New in the second version
FR-MP-BC-02	Blockchain certification	The Market Platform allows to Market participant to verify all the market data registered in the blockchain	UC-IT-1 UC-IT-2	Completed	New in the second version
FR-MP-SET-01		The Market Platform allows to Aggregator to create new smart contracts with settlement mechanisms via UI	UC-IT-1 UC-IT-2	Completed	New in the second version

FR-MP-SET-02		The Market Platform provides to Aggregator Platform a list of available Smart Contracts with settlement mechanisms	UC-IT-1 UC-IT-2	**Completed**	New in the second version
FR-MP-SET-03	Settlement	The Market Platform is able to read meters measurements from SCD	UC-IT-1 UC-IT-2	**Completed**	**Renamed from** FR-MP-S-01
FR-MP-SET-04	Settlement	The Market Platform performs the settlement comparing the metering data and BSP baseline	UC-IT-1 UC-IT-2	**Completed**	Renamed from FR-MP-S-02. BSP replaced BRP.
FR-MP-SET-05	Settlement	The Blockchain Service Layer is able to provide tokenization system for the settlement through Smart Contracts functionalities	UC-IT-1 UC-IT-2	**Completed**	Renamed from FR-MP-S-03. New in the second version
FR-MP-SET-06	Settlement	The Market Platform allows to DSO, TSO and Aggregator to read the settlement outcomes	UC-IT-1 UC-IT-2	**Completed**	FR-MP-S-04
Market Platform – Non-Functional Requirements					
P-MP-01	Communication protocols	The Market Platform exposes REST APIs for collecting flexibility requests and flexibility offers	UC-IT-1 UC-IT-2	**Completed**	
P-MP-02	Communication protocols	The Market Platform provides a message broker for communicating market results	UC-IT-1 UC-IT-2	**Completed**	
T-MP-01	Communication Protocols, Timing	The Market Platform is able to receive measurements from SCD Kafka Broker every 15 minutes	UC-IT-1 UC-IT-2	**Completed**	

T-MP-02	Timing	The Market Platform is able to schedule day ahead and real time Market sessions at prefixed times and in automatic way	UC-IT-1 UC-IT-2	**Completed**
S-MP-01	Security	Market Platform must expose all its REST APIs under Oauth2.0 authentication and client credentials	UC-IT-1 UC-IT-2	**Completed**
S-MP-02	Security	Market Platform must identify all the Kafka clients using two-way authentication and server/client certificates	UC-IT-1 UC-IT-2	**Completed**
S-MP-03	Security	All the Market Platform interfaces must be exposed using TLS connections	UC-IT-1 UC-IT-2	**Completed**

3 Interfaces and Communication Mechanisms

3.1 REST API
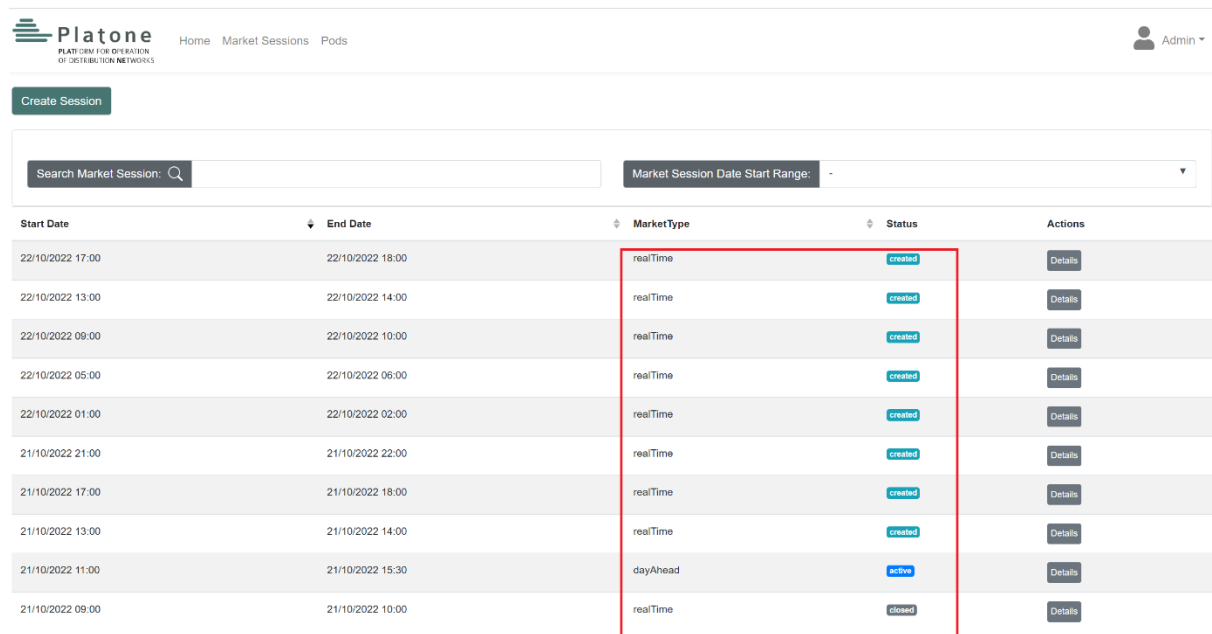
The second version of the Platone Market Platform implements a new authenticated API used by the aggregator for retrieving the wallet balance of a specific pod. This information is directly retrieved from the blockchain service layer and is used for the visualisation of the Platone Token balance within the Customer app (App Flessibili) [6].

Table 9: Market Platform new REST API

Name	Url	Method	Parameters	Responses
Retrieve Balance	/contracts/transactions/balanceOf/:pod	GET	In request: PoD : String	Success (200) Wallet Balance Error (500) Error Message - *String*

3.2 User Interfaces

The figures below show the new features implemented in the Platone Market Platform Dashboard described in Chapter 2.2.3

Figure 3: Day Ahead and Intra Day (Real Time) sessions management

Figure 4: Real Time session detail with requests and offers

Figure 5: Filtering bar in the Market Session section

Figure 6: Download market data button (included in all the sections)

4　Languages, Technologies and External Tools

There are no updates about languages, technologies and external tools with respect to the first version of the Platone Market Platform (see D2.3 [5]). The Table 10 below is reported for convenience of the reader.

Table 10: Languages, Technologies and External Tools

Layer/Component	Languages	Technologies/Framework	External Tools
UI Layer	Javascript HTML5 CSS/SCSS	Docker Vue.js	Nginx
Service Layer	Javascript	Docker NodeJs ExpressJs	
Data Layer	Javascript	Docker NodeJs	MongoDB
Communication Layer	Javascript	Docker REST APIs NodeJs	Apache Kafka Express Gateway
Blockchain Service Layer	Solidity	Docker Truffle	Ethereum Blockchain Nodes

5 Packaging and Deployment

No relevant updates about the deployment process are provided in the second version of the Platone Market Platform. Refer to D2.3 for the specifications and step-by-step deployment. More details can be found in the READ.ME file in the source code repository (see Chapter 5.1).

5.1 Availability

The source code and the Docker Files necessary for the deployment of the Platone Market Platform are available in the RWTH GIT repository [7]. ENG also provides a demo version, hosted in its cloud environment located at Pont-Saint-Martin (Italy). All the available interfaces are now under HTTPS (over TLS) connection.

Software REPO

Github -> https://git.rwth-aachen.de/acs/public/deliverables/platone

Demo Version

Web Dashboard -> https:// platone.eng.it

REST API -> https://platone.eng.it:8081/api

Blockchain Interface -> https://platone.eng.it:8081/api/contracts

Message Broker -> https://platone.eng.it:9042

6 Conclusion

The work done at this stage conducted to the implementation of the second prototype of the Platone Market Platform.

The second version of the Platone Market Platform was implemented as fully functional, satisfying all the functional and non-functional expected requirements, concluding the work done in the first prototype release.

This second version includes the management of integrated Day-Ahead and Intra-Day session, as well as a complete integration with the blockchain service layer for the certification of the market data results and for the tokenisation of the settlement phase for the end-customer.

In addition, an updated web dashboard was released with new features for the market players.

As result of this new implementation, all market results are certified and stored in the blockchain infrastructure, the settlement phase is activated at the end of each Intra-Day Session and validated providing Platone Token to the end-customers.

An updated detailed description of the data models and interfaces is also provided, and a new version of the source code is available in the public GIT repository, together with a new demo version in the ENG cloud infrastructure.

Finally, the second release of the Platone Market Platform will be integrated and tested in the Platone Open Framework and in particular in the architecture of the Italian demo site.

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[1] European Commission, "2050 long-term strategy", [Online]. Available: https://ec.europa.eu/clima/policies/strategies/2050_en

[2] *Grant Agreement No. 864300 – Platone.*

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[4] *"D2.2 PlatOne Platform requirements and reference architecture (v2)", Platone EU Horizon 2020 Project, 2022.*

[5] *"D2.3 PlatOne Market Platform (v1)", Platone EU Horizon 2020 Project, 2020.*

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10 List of Abbreviations

Abbreviation	Term
API	Application programming interface
DSO	Distribution System Operator
HTTPS	HyperText Transfer Protocol over Secure Socket Layer
OS	Operating System
PoD	Point of Delivery
REST	Representational state transfer
SOs	System Operators
TLS	Transport Layer Security
TSO	Transmission System Operator
UI	User Interface