MODELLING METERING DATA FLOWS, FROM USE CASES TOWARDS IMPLEMENTATION

Karima BOUKIR
enedis – France
Karima.Boukir@enedis.fr

Bruno TRAVERSON
EDF R&D – France
Bruno.Traverson@edf.fr

Rok POVSE
University Ljubljana - Slovenia
rok.povse@fri.uni-lj.si

ABSTRACT

FLEXICIENCY project aims at providing a Market Place for European electricity distribution stakeholders. This paper focuses on modelling activities held in the project on meter data and their exchange among stakeholders.

INTRODUCTION

Major European Distribution System Operators (DSOs) are working together with market players and other stakeholders within the Horizon 2020 – LCE-07-2014 project FLEXICIENCY to develop a technical model in order to achieve a vision of data exchange based on the meter data accessibility provided by DSOs.

A virtual Information and Communication Technology (ICT) environment - called Market Place - will catalyze the interactions between relevant stakeholders and encourage cross-country and cross-player access to innovative energy services based on metering data. Standardized interfaces will be developed to integrate the platforms of different players – also called Market Players [1]. Also, as shown in Fig. 1, physical data transfer will be achieved in a Business to Business (B2B) way. In case of individual data, customer consent will be managed prior to any data delivery.
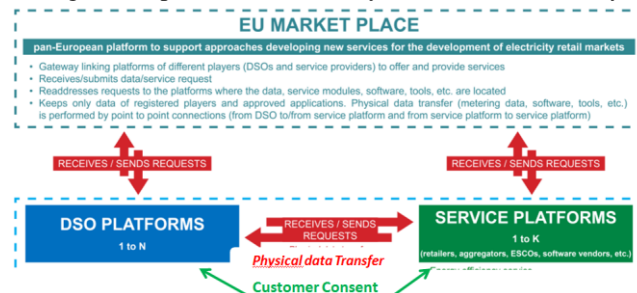

Figure 1. Market Place and Market Players

Five large-scale demonstrations will be carried out (in Austria, France, Italy, Spain and Sweden) to demonstrate the facilitation and acceleration of deployment of novel services in the electricity retail markets, ranging from advanced monitoring to local energy control, and flexibility participation. The use cases description is given in [2].

This paper aims at defining the architecture of the data exchanges, needed to deploy the energy services listed above. It specifies mainly content of common messages towards data exchange standardization at B2B level. Inputs extracted from the use cases and existing standards have been used in order to guarantee interoperability and service accessibility to all players in the energy market at EU level. We focus, here, on the data model that covers exchange messages within FLEXICIENCY system, mainly for metering data delivery (as a B2B data service offered by FLEXICIENCY's Market Place). The demonstrations of the use of these data for energy services towards customer are carried out in the ongoing WP 5-9, respectively in Italy, France, Spain, Sweden and Austria.

USE CASES

The use cases stating common & shared services in FLEXICIENCY systems are the following (Tab. 1). Full use case list and description is published in [2].

Code	Title
WP2_1	New market player enrols in the market place
WP2_2	Market participant manage its services & Market participant "pass" a MP certification
WP2_3	Market Player enrols to a new service
WP2_4	Service activation
WP2_5	Service Requester requests the service stop
WP2_6	Service Requester requests the service cancellation
WP2_7	Identification of MP service providers based on localization input
WP2_8	Service Provider requests statistics regarding service execution
WP2_9	Manage ancillaries services (of the Market Place)
WP2_10	Collect customer consent for transmission
WP2_11	Revoke customer consent for transmission
WP2_12	Technical Set-up and Validation
WP2_13	Market player service requester quits a subscribed service

Table 1. Use Cases covering common components

DATA MODEL

Common areas extracted from the use cases can be organized into five sets:

- **Market Place and Market Players (MKP)**: description of the Market Place (localization, general information) and of its Market Players (roles, localizations and associated accounts).
- **Service Offer and Subscription (MKP)**: publication in

the Market Place of service offers by service providers and submission of service subscriptions by service requesters.
- **Customer Consent (B2C)**: consent given/withdrawn by Customer to a data service provider for transmission of his/her individual metering data to a third party.
- **Service Activation (B2B)**: service activation (data precisions and agreement validation among related parties) between Market Players.
- **Service Provision (B2B)**: service provision (data exchanges and acknowledgements) between Market Players.
The data model follows this organization and can be split into five data sets. More detailed information is given in [3].

Market Place and Market Players

The following figure (Fig. 2) provides a representation of the data model from a semantic point of view for the business objects concerned with Market Place and Market Players.
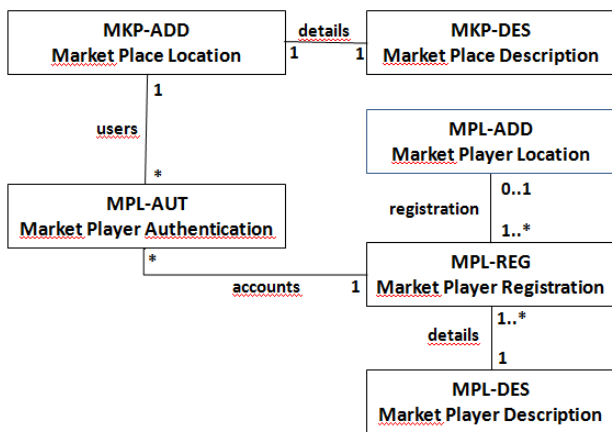

Figure 2. Market Place (MKP) and Market Players (MPL)

Market Place Location (MKP-ADD) is the business object representing access points to FLEXICIENCY Market Place. There may be several access points corresponding to platforms hosting FLEXICIENCY Market Place services. Addresses of these platforms are given in a standardized format (URI: Uniform Resource Identifier). MKP-ADD is linked to a standard description of the Market Place (MKP-DES) which is unique among all the platforms. Market Players enroll in the Market Place one or several contact points known as users of the Market Place. Market Player Authentication (MPL-AUT) is characterized by authentication information. MPL-ADD is linked to the Market Player Registration (link to MPL-REG). Market Player Description (MPL-DES) contains all the information about the company that seats behind the Market Player registration.

Company/Actor
Actor types identified at this time are:
• Energy Regulated Player: DSO, TSO or any Metering

Data Manager.
• Energy Unregulated Player: Retailer, ESCO, Aggregator.
• Industrial Player: technology providers, manufacturers, energy asset (such as PV, sensors, etc) owners.
• Research Institute: University or any independent research body.
• Public Body: EU, Energy Regulators, Local Authorities, Energy Associations.

Roles
Market Player roles identified at this time are:
• Regulated Data Provider: provides individual metering data, aggregated data, or data analytics.
• Unregulated Data Provider: provides data records from assets, or weather data records.
• Regulated/Unregulated Service Provider: provides support services (called service exchange in [2]).
• Regulated/Unregulated Service Requester: requests for data or support services.

Service Offer and Subscription

The following figure (Fig. 3) provides a representation of the data model from a semantic point of view for Service Offer and Subscription business objects.
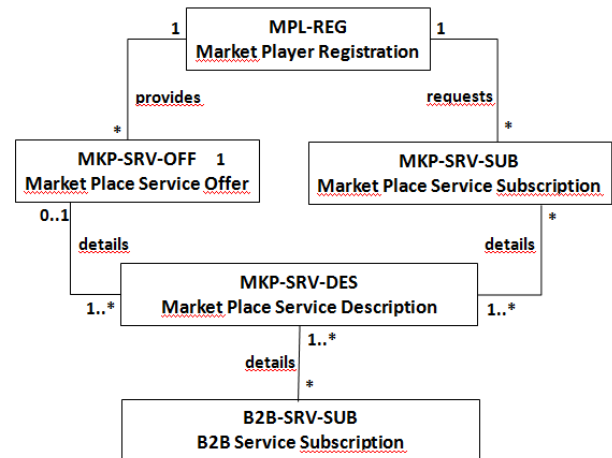

Figure 3. Service Offer and Subscription

Market Place Service Offer (MKP-SRV-OFF) gathers information about a service offer as published by a Service Provider already enrolled in the Market Place (link to MPL-REG). It is identified by an identifier globally unique in the scope of the Market Place and is characterized by a service type. Detail on the service offer is given by a set of service descriptions (link to MKP-SRV-DES).

Market Place Service Subscription (MKP-SRV-SUB) relates to a service demand as subscribed by a Service Requester already enrolled in the Market Place (link to MPL-REG). It is identified by an identifier globally unique in the scope of the Market Place and is

characterized by a service type. Detail on the service subscription is given by a set of service descriptions (link to MKP-SRV-DES).

Service Types
The B2B exchange service categories identified in the Market Place are:
• Individual Data Provision - Metering data subject to customer consent.
• Aggregated Data Provision – Aggregated data calculated from different sources & data processes.
• Energy Service Provision - kind of support exchange such as energy market business case/technical evaluation.

Market Place Service Description (MKP-SRV-DES) gives detailed information on a service. It is linked to a service offer (link to MKP-SRV-OFF) if such an offer exists in the Market Place and to service subscriptions (link to MKP-SRV-SUB) if several service demands have been submitted for such an offer to the Market Place. It is characterized by a short description (a summary of what the service is about), usage details (pre-requisites that the user of the service should verify). For instance, a service of Aggregated Data type is characterized by : aggregation level, aggregation method, quantity (kind of numerical value of the data provided or used in the service provided), period (period of time covered by the data provided or of the data used in the service provided), localization (characterization of the location of the data provided or used in the service provided), time step (time interval between two values of the data provided or used in the service provided) and customer consent (determines if customer consent is mandatory or not for this service).

Customer Consent
The following figure (Fig. 4) provides a representation of the data model from a semantic point of view for the business objects concerned with Customer Consent.
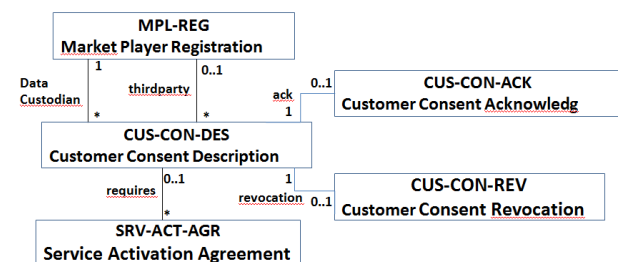

Figure 4. Customer Consent

Customer Consent Description (CUS-CON-DES) gathers the information about consent given by a customer to his/her data custodian for transmission to a third party. Both the data custodian and the third party are Market Players enrolled in the Market Place (links to MPL-REG). Customer consent may be either withdrawn (link to CUS-CON-REV) or used in one or several service activation agreement (link to SRV-SCT-AGR). Customer

Consent is identified by an identifier globally unique in the scope of the Market Place and is characterized by the identifier of the customer, a list of PODs (points of delivery that are sources of data values concerned by the consent), data details (further information on data values concerned by the consent), processing details (further information about the kind of processing that will be operated on the data values), validation date (date of the validation of the consent by the customer), start date (start date of the period covered by the consent) and end date (end date of the period covered by the consent).

Customer Consent Acknowledgement (CUS-CON-ACK) is the acknowledgement of the consent previously given by a customer to his/her data custodian for transmission to a third party (referred to by the link to CUS-CON-DES). Customer Consent Revocation (CUS-CON-REV) is about revocation of the consent previously given by a customer.

Service Activation
The following figure (Fig. 5) provides a representation of the data model from a semantic point of view for the business objects concerned with Service Activation.
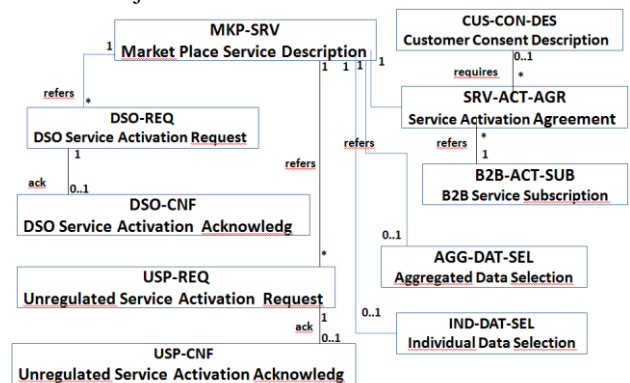

Figure 5. Service Activation

Service Activation Request (DSO-REQ) refers to the service description as published in the Market Place (link to MKP-SRV-DES) and is characterized by service requester identification and the portfolio of points of delivery concerned by the service activation if such a portfolio exists at the time the request is submitted.

Unregulated Service Activation Request (USP-REQ) refers to the service description as published in the Market Place (link to MKP-SRV-DES) and is characterized by service requester identification.

During service activation, selection of data provided or used by the service may be redefined. In case of individual data, Individual Data Selection (IND-DAT-SEL) defines data selection criteria specific for this activation while, in case of aggregated data, Aggregated Data Selection (AGG-DAT-SEL) is used. Both business objects refer to Market Place Service Description (link to

MKP-SRV-DES).

Individual Data Selection (IND-DAT-SEL) and Aggregated Data Selection (AGG-DAT-SEL) are respectively characterized by quantity (kind of numerical value of the data provided or used in the service provided), period (period of time covered by the data provided or of the data used in the service provided), localization (characterization of the location of the data provided or used in the service provided) and time step (time interval between two values of the data provided or used in the service provided). On the top of that, Aggregated Data Selection (AGG-DAT-SEL) is characterized by aggregation level (level of aggregation of data provided or used in the service provided), aggregation method (aggregation method used in case of aggregated data).

Service Activation Agreement (SRV-ACT-AGR) represents the contractual form of the service activation. It is linked to the service description (link to MKP-SRV-DES) and, if customer consent is mandatory, to customer consent description (link to CUS-CON-DES). It also refers to the B2B Service Subscription concerned by the service activation (link to B2B-SRV-SUB). It is characterized by an identifier globally unique in the Market Place, the portfolio of points of delivery concerned by the service activation if any, details on data and on envisaged processing, date of validation of the agreement and period of validity of the agreement (start and end of the period).

Service Provision

The following figure (Fig. 6) provides a representation of the data model from a semantic point of view for the business objects concerned with Service Provision.

In case of Individual Data Service
Individual Data Value (IND-DAT-VAL) is composed of time-stamped values originating from a list of points of delivery. Acknowledgement (IND-DAT-ACK) is characterized by the list of acknowledged usage points and, for each, time-stamped status.

In case of Aggregated Data Service
Aggregated Data Value (AGG-DAT-VAL) is composed of time-stamped values gathered in a list of aggregates. Acknowledgement (AGG-DAT-ACK) is characterized by the list of acknowledged usage points and, for each, time-stamped status.

In case of Support Service
Technical Validation Request is represented by (TECH-FLEX-REQ) and acknowledgement by Technical Validation Response (TECH-FLEX-RESP).
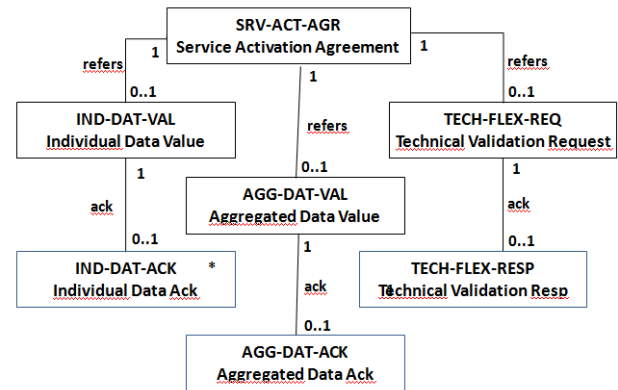

Figure 6. Service Provision

INTERFACES

The three interfaces that must be supported to allow interoperability between FLEXICIENCY components are the following:

Market Place Interface

Market Place Interface: interactions between Market Place and Market Players. It supports the first two data sets: Market Place and Market Players, Service Offers and Subscriptions. The following table (Tab. 2) gives the list of the Business Objects exchanged with the Market Place System and the direction for these objects.

Data Set	Business Objects	Direction
Market Place and Market Players	MKP-DES - Market Place Description	Market Place -> Market Player
	MPL-REG - Market Player Registration	Both directions
	MPL-ADD - Market Player Location	Market Player -> Market Place
	MPL-DES - Market Player Description	Market Player -> Market Place
	MPL-AUT - Market Player Authentication	Market Player -> Market Place
Service Offer and Subscription	MKP-SRV-OFF – Market Place Service Offer	Both directions
	MKP-SRV-SUB – Market Place Service Subscription	Both directions
	B2B-SRV-SUB – B2B Service Subscription	Market Place -> Market Player
	MKP-SRV-DES – Market Place Service Description	Both directions

Table 2. Market Place Interface

B2B Interface

B2B Interface: interactions between Market Players. It supports the last three data sets: Customer Consent, Service Activation and Service Provision. The following table (Tab. 3) gives the list of the Business Objects exchanged in the B2B interactions and the direction for these objects, where DSO is a data service provider to

any Market Player.

Data Set	Business Objects	Direction
Customer Consent	CUS-CON-ACK – Customer Consent Acknowledgement	DSO-> Market Player
	CUS-CON-REV – Customer Consent Revocation	DSO-> Market Player
Service Activation	DSO-REQ – DSO Service Activation Request	Market Player -> DSO
	DSO-CNF – DSO Service Activation Acknowledgement	DSO-> Market Player
	USP-REQ – Unregulated Service Activation Request	Market Player -> DSO
	USP-CNF – Unregulated Service Activation Acknowledgement	DSO-> Market Player
	IND-DAT-SEL - Individual Data Selection	Both directions
	AGG-DAT-SEL - Aggregate Data Selection	Both directions
	SRV-ACT-AGR – Service Activation Agreement	Both directions
Service Provision	IND-DAT-VAL - Individual Data Value	DSO-> Market Player
	IND-DAT-ACK - Individual Data Acknowledgement	Market Player -> DSO
	AGG-DAT-VAL - Aggregate Data Value	DSO-> Market Player
	AGG-DAT-ACK - Aggregate Data Acknowledgement	Market Player -> DSO

Table 3. B2B Interface

B2C Interface

B2C Interface: interactions between a Market Player and a Customer. It supports the Customer Consent data set.
The following table (Tab. 4) gives the list of the Business Objects exchanged in the B2C interactions and the direction for these objects.

Data Set	Business Objects	Direction
Customer Consent	CUS-CON-DES – Customer Consent Description	DSO-> Market Player
	CUS-CON-REV – Customer Consent Revocation	DSO-> Market Player

Table 4. B2C Interface

IMPLEMENTATION

Fig. 7 below illustrates MP Service details. This view is accessible to market participant, who has access to MP and has registered at least one service. The end-user, who is a representative of certain organization and branch, can view and, in some cases, also edit information about considered service. This information includes: a) common attributes for all service types, such as service name, description, URL for additional information, usage details, period of availability; b) service-category-specific information, as stated above. For more information on how to access the MP see URL [4].
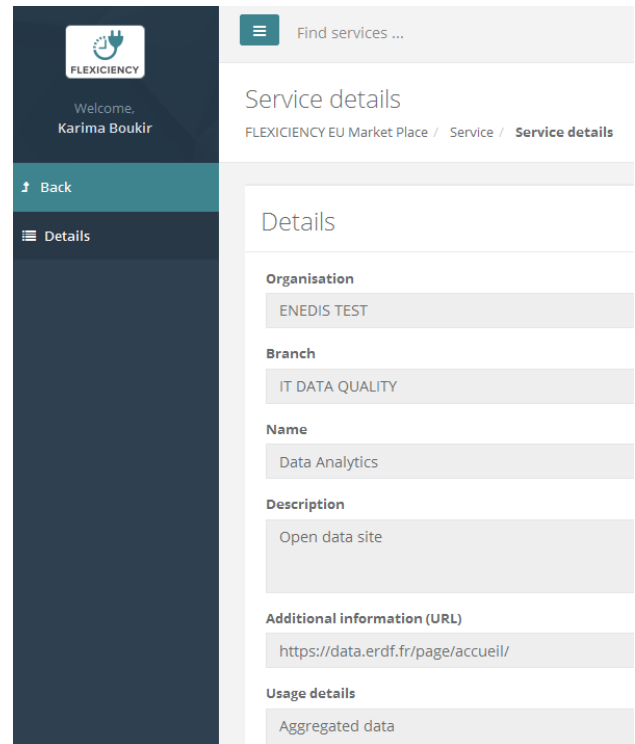

Figure 7. FLEXICIENCY Market Place. Service Details

CONCLUSION

This model defines the technical scope of common areas to be shared within the project. It provides guidelines and starting point for implementation, feeding the future development. During implementation process, some points (especially Service description) will need to be extended or refined to better specify their content.

ACKNOWLEDGMENTS

REFERENCES

[1] FLEXICIENCY, 2016, "D2.2 – Definition of project overall system architecture". See [5]
[2] FLEXICIENCY, 2016, "D2.1 – Definition of services and use cases description". See [5]
[3] FLEXICIENCY, 2016, "D2.3 – Data model and interfaces". See [5]
[4] Market Place URL: https://flexweb-adf87c280.dispatcher.hana.ondemand.com
[5] FLEXICIENCY Website http://www.flexiciency-h2020.eu/deliverables-and-scientific-publication