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Data exchange role model

Task 5.1 Data exchange conceptual model

EU-SysFlex

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EU-SysFlex

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ABBREVIATIONS AND ACRONYMS

BUC	Business Use Case
DEP	Data Exchange Platform
DER	Distributed Energy Resources
DSO	Distribution System Operator
EC	European Commission
ESCO	Energy Service Company
EU	European Union
EU-SYSFLEX	Pan-European System with efficient coordinated use of flexibilities for the integration of a large share of Renewable Energy Sources (RES)
HEMRM	Harmonized Electricity Market Role Model
IEC	International Electrotechnical Commission
IT	Information Technology
MO	Market Operator
OO	Optimisation Operator
SGAM	Smart Grid Architecture Model
SO	System Operator
SUC	System Use Case
TSO	Transmission System Operator
WP	Work Package

1. INTRODUCTION

According to the Description of Action of EU-SysFlex, the outcome of task 5.1 is conceptual data exchange model for the pan-European electricity system with descriptions, including functionalities, processes, roles and services. The model does not imply a single data exchange platform but rather allows for interoperability of different platforms across Europe.

Data regarding electricity consumption has never before been as abundantly generated as it is now in the era of Big Data and therefore can be used for forecasts and be a valuable source of information to balance supply with demand or manage network congestions. While the topic of metering data processing has been addressed and regulated, this is not the case with access and sharing (including across the borders) of end-user electricity consumption data. The situation regarding collecting and processing consumption data varies across states in terms of regulation and across energy providers in terms of advancement in the adoption of information technology. It is a challenge to develop a single homogenous model or a set of rules to fit all. Requirements of network codes and new market design legislation need to be considered when developing a data exchange model.

The objective of sub-task 5.1.9 consists in defining a data exchange role model describing, in a static way (i.e. without the dynamism of activity diagrams of Task 5.2 data exchange SUCs), how Business Roles interact with one another and which data they exchange. Based on Task 5.2 data exchange SUCs and associated definitions (cf. §2 in D5.2 deliverable), an analysis has been realized on:

- The exchanged data,
- The systems used to exchange them,
- The mapping between these systems and the Business Roles who operate them,
- The mapping between these Business Roles and the roles defined in the Harmonized Electricity Market Role Model (HEMRM) developed by ENTSO-E, EFET and ebIX® for Internal Electricity Market in Europe (IEM).

This analysis led to the definition of a data exchange role model built on the scenarios of Task 5.2 data exchange SUCs and the Business Roles who operate the involved systems or interact with them.

The objective of this data exchange role model is to:

- Relate Business Roles with one of the already existing role from the HEMRM,
- Identify new Business Roles motivated by business or IT needs.

The report is structured as follows:

- Overview of exchanged data,
- Systems used to exchange data,
- Mapping between systems used to exchange data and Business Roles who operate these systems,
- Business role model,

- Reconciliation with the HEMRM,
- Conclusion giving some propositions for new business and IT roles that could be reported to ENTSO-E, EFET and ebIX®.

2. EXCHANGED DATA

The following diagram reflects every Business Object mentioned in Task 5.2 data exchange SUCs.

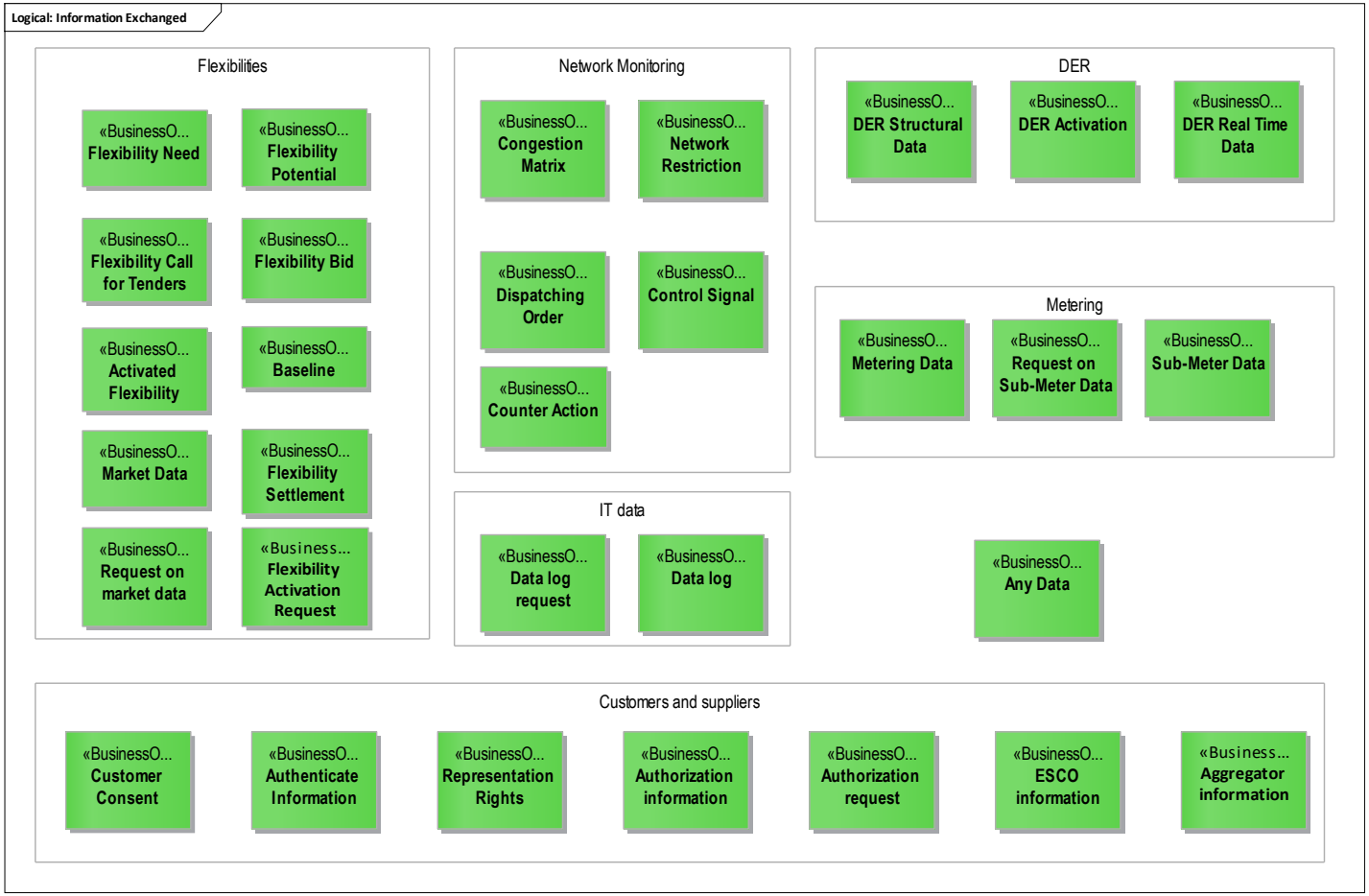

FIGURE 1: BUSINESS OBJECTS DIAGRAM

In this diagram, Business Objects are clustered into categories of Business Objects (e.g. Flexibilities, Network Monitoring).

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3. SYSTEMS USED TO EXCHANGE DATA

Systems to be used for exchanging data as stated in Task 5.2 data exchange SUCs can be represented with the following diagram.

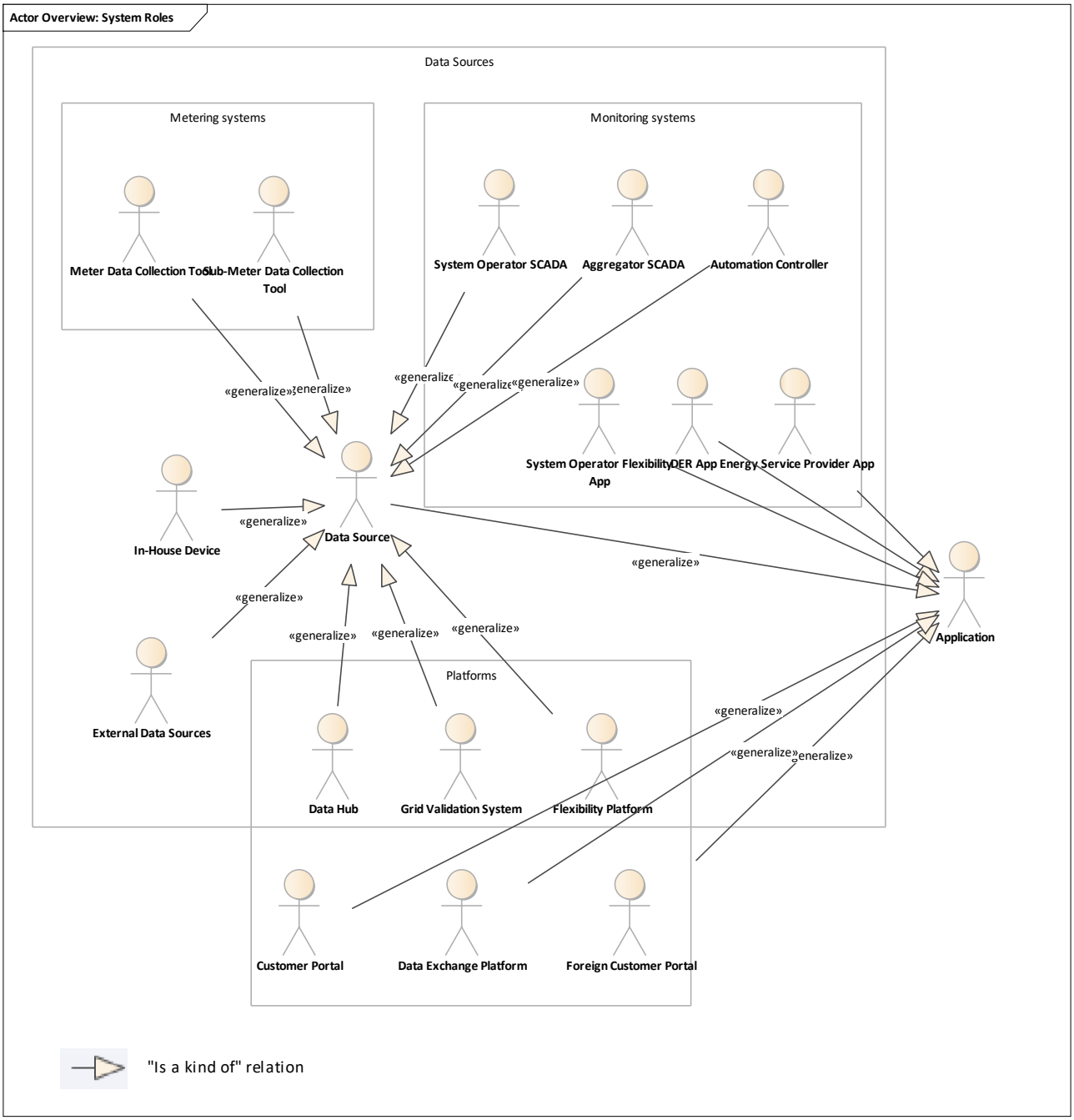

FIGURE 2: SYSTEM ROLES DIAGRAM

In this diagram, systems are grouped into several categories of systems (e.g. platforms, metering systems, monitoring systems). Arrows between systems mean “is a kind of” (e.g. a Data Hub is a kind of Data Source). Descriptions of these systems will be provided in D5.2 deliverable.

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4. MAPPING BETWEEN SYSTEMS USED TO EXCHANGE DATA AND BUSINESS ROLES WHO OPERATE THESE SYSTEMS

Systems are defined by a set of functionalities. Each system is operated by a Business Role whose responsibility must fit the functionalities of the system (e.g. a System Operator SCADA is operated by a System Operator). A system is used by the Business Role who operates it but can be used by other Business Roles (e.g. a Customer Portal is operated by a Customer Portal Operator and is used by Customers, Authentication Service Provider, etc.).

Business Roles exchanging data and involved in Task 5.2 data exchange SUCs can be represented with the following diagram.

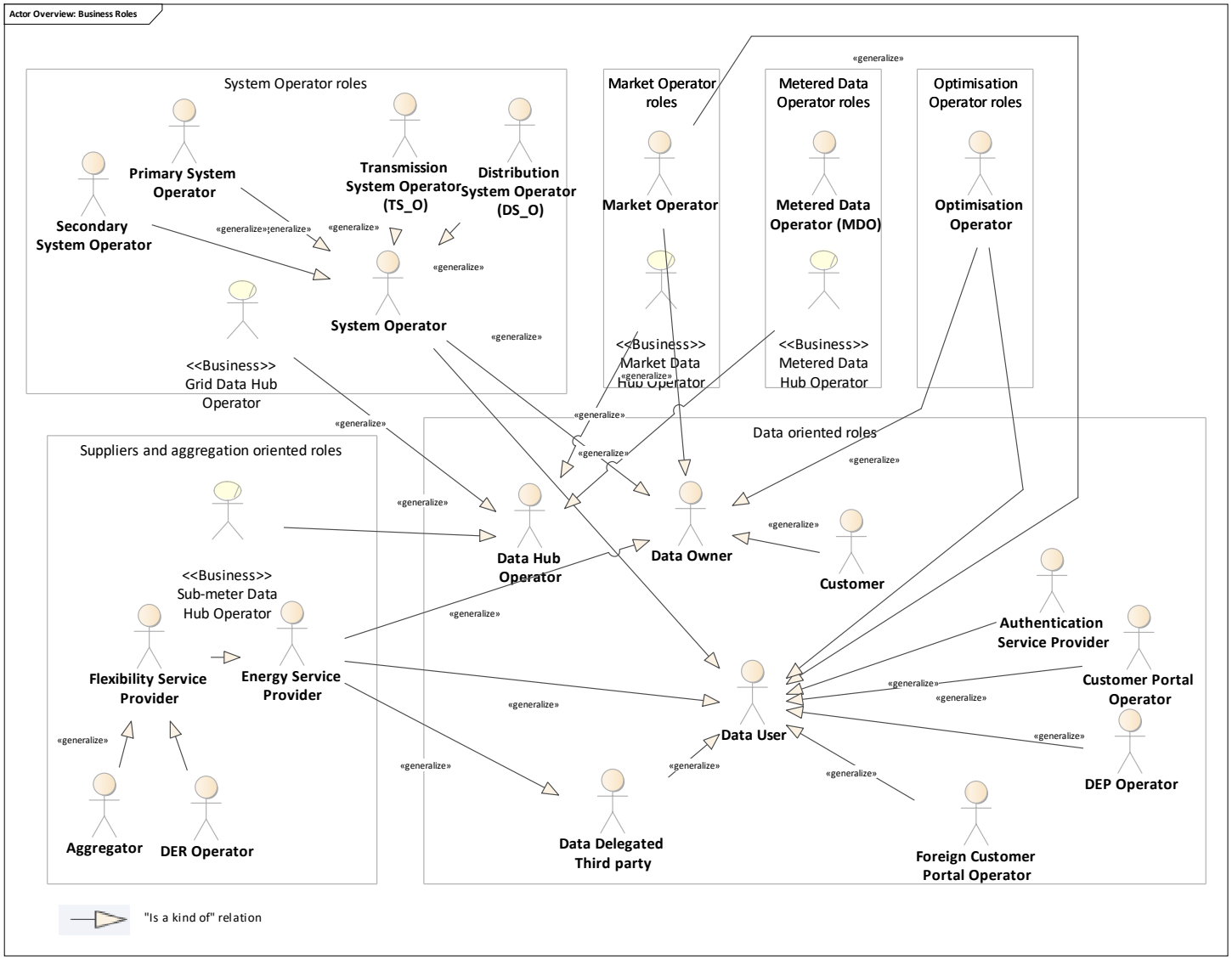

FIGURE 3: BUSINESS ROLES DIAGRAM

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In this diagram, Business Roles are grouped into several categories of Business Roles (e.g. System Operator roles, Data oriented roles). Arrows between Business Roles mean “is a kind of” (e.g. a Transmission System Operator is a kind of System Operator). Descriptions of these Business Roles are available below.

The mapping between systems used to exchange data and Business Roles who operate them is represented with the following diagram.

FIGURE 4: SYSTEM ROLES ALONG WITH BUSINESS ROLES

Task 5.2 data exchange SUCs focus on both business roles and systems. They do not formally associate systems and business roles, apart from what it is written in the descriptions of actors in SUCs (cf. §3.1 of each Task 5.2 data exchange SUC). The above diagram is intended to represent these associations (notably Market Operators operating Flexibility Platforms and new business actors such as Customer Portal Operators operating new systems). It also maps systems with business roles inside business-oriented boundaries, as functionalities of systems must be aligned with business responsibilities of business roles.

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As a business role model should only represent Business Roles and data exchanged between each other, this diagram should not be considered as part of the business role model per se. It is just presented as an intermediate analysis that gives coherence between systems, business roles, data exchanges SUCs and the business role model.

5. BUSINESS ROLE MODEL

A business role model describes, in a static way, how Business Roles interact with each other and which data they exchange. Business Roles exchange data through systems, either because they use these systems or because they interact with them.

A data exchange role model was built thanks to the scenarios of Task 5.2 data exchange SUCs and the Business Roles who operate the involved systems or interact with them. This business role model can be represented with the following diagram.

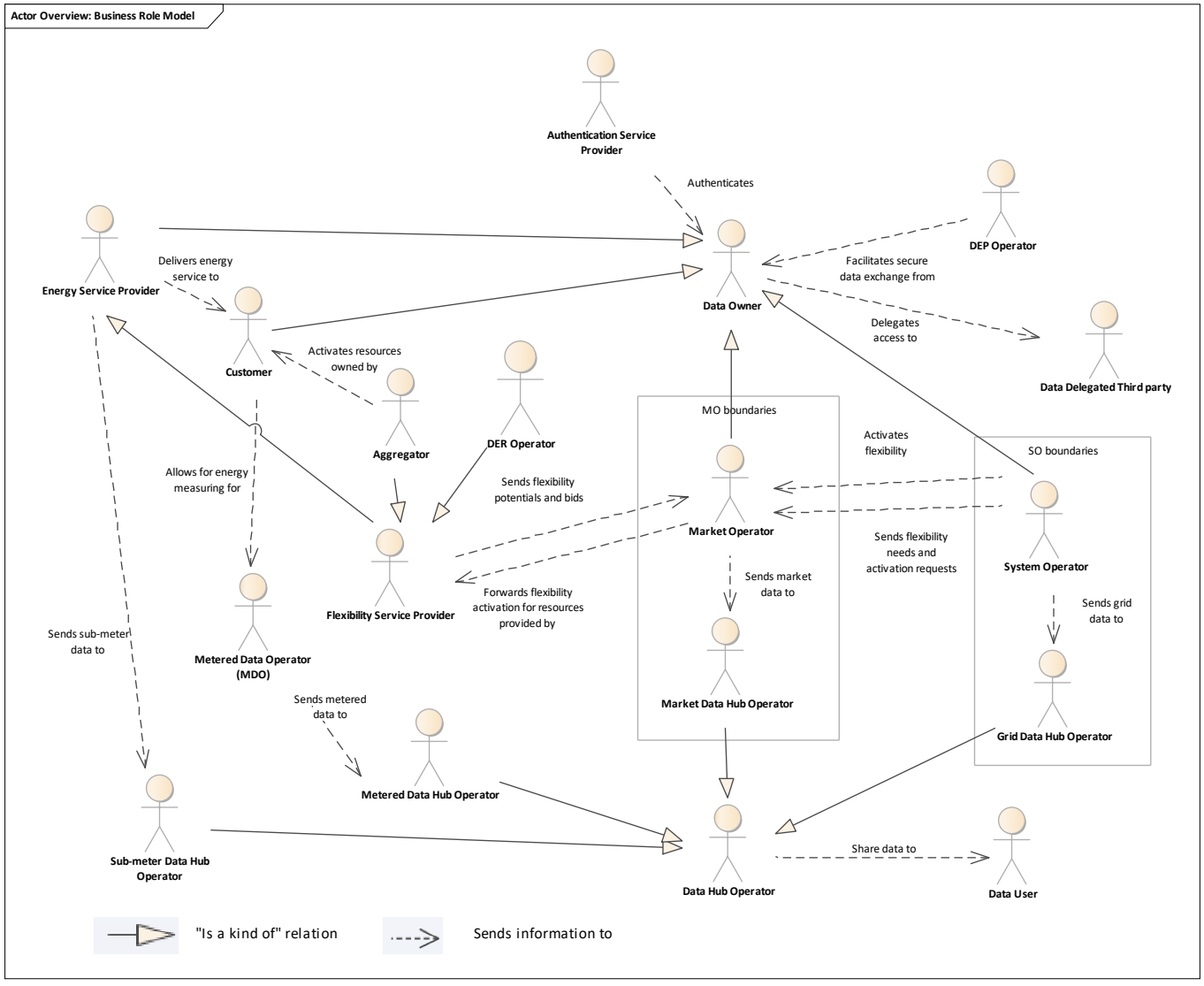

FIGURE 5: BUSINESS ROLE MODEL

The arrows with dashed lines represent relationships between Business Roles (e.g. the Metered Data Operator collects metered data from customers). The arrows with solid lines represent generalizations, meaning “is a kind of” (e.g. the Aggregator is a kind of Flexibility Service Provider). This figure does not show all “Is a kind of” relations,

meaning there are also further “Is a kind of” relations between Business Roles displayed in ”Figure 3: Business Roles diagram”.

The above diagram and the data exchange SUCs (see D5.2 report[1]) of Work Package 5 do not represent Optimisation Operator (OO) as defined in Work Package 3 of EU-SysFlex which operates Grid Validation Systems as defined in Work Package 5. The role of the OO would theoretically be needed in the data exchange SUCs “Manage flexibility bids” and “Manage flexibility activations”. The D3.2 report[2] elaborates the discussion about optimization approaches, optimization operators and the allocation of this role to an actor.

According to the results of D3.2 the OO and MO (comparable to Flexibility Platform in WP5) roles can theoretically be carried out by different actors. WP3 discusses and analyses three different possibilities to allocate the OO to actors, namely the MO, the SO or a third party.

In order to deal with the fact that there are more than one option to allocate the OO and to deal with different underlying business assumptions, the Data Exchange SUC of WP5, which theoretically would need to include the OO role, have investigated two options of the above described possibilities, that result from the analysis of D3.2. The two alternatives of the Data Exchange SUC of WP5 represent two implicit options of OO allocations and data exchange approaches:

- Alternative 1 represents a centralised optimisation as defined by D3.2. The MO selects flexibility bids based on partial grid data. Concludingly, the MO acts as OO.
- Alternative 2 represents a decentralised optimisation as defined by D3.2 with comprehensive grid data exchange. The SO selects the flexibility bids and therefore the OO role is implicitly allocated to the SO.

Deliverable D3.2 concludes that: “All solutions are feasible and, to properly allocate the roles of OO and MO, it is necessary to conduct a cost-benefit analysis, considering all chances and risks, but specifically also addressing national specificities (regulation, number of DSOs and TSOs within a bidding zone, existing processes of optimisation, historical organisation, etc.) and choice for centralised or decentralised optimisation. Regardless of the national situation, it can be concluded that an allocation of the optimisation to an actor other than each individual system operator, being responsible for the safety of their systems under Articles 31 and 40 of the Electricity Directive (European Parliament and Council of the European Union, 2019), leads to significant governance and regulation challenges.”

The following two diagrams in **Error! Reference source not found.** show how a theoretical integration of the OO in these two SUCs would look like (this was not done in the UML model for Task 5.2 data exchange SUCs due to parallel activities in the project) with one allocation to the MO and one to the SO. In these two SUCs, two options have been studied and consist in placing Optimisation Operator inside Market Operator or System Operator boundaries. For these three involved Business Roles, the two options lead to the following business role models:

[1] To be delivered in October 2020.
[2] https://eu-sysflex.com/wp-content/uploads/2020/06/EU-SysFlex_Task-3.2-Deliverable-Final.pdf

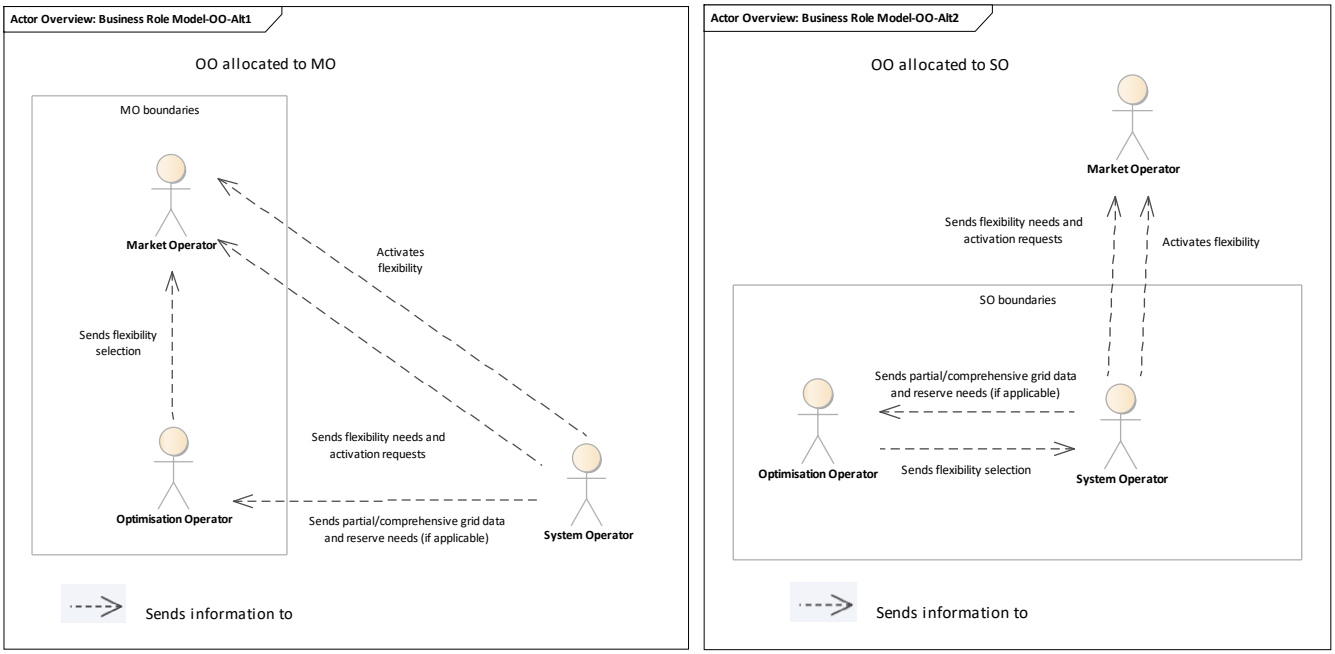

FIGURE 6: BUSINESS ROLE MODEL FOR OPTIMISATION OPERATOR

6. RECONCILIATION WITH HEMRM

Most of these identified Business Roles and listed below can be mapped, fully or mostly, to the HEMRM[3]. The other ones reflect the new business and IT needs.

EU-SysFlex Work Package 5		HEMRM v2020-01	
Business Roles	Descriptions	Business Roles	Descriptions
Aggregator	Aggregate and maximise the value of the portfolio(s) of resources (cf. definition in T3.3 deliverable).	Resource Aggregator	A party that aggregates resources for usage by a service provider for energy market services.
Authentication Service Provider	Trust authority. Verifies the identity of authenticating parties. Some countries will have their own authentication service provider. For countries which will not, there may be a more global and to be defined one.	Not available	
Customer	Consumer, generator or storage facility owner.	Party Connected to the Grid	A party that contracts for the right to consume or produce electricity at an Accounting Point.
Customer Portal Operator	Operates a Customer Portal.	Not available	
Data Delegated Third party	Any natural person who has received representation rights from a data owner.	Not available	
Data Hub Operator	Data hub operator owns and operates an information system whose main function is to store and make available electricity (also gas, heat) metering data and associated master data. Can be : • Grid Data Hub Operator in the sphere of a System Operator • Market Data Hub Operator in the sphere of a Market Operator • Meter Data Hub Operator in the sphere of a Metered Data Operator • Sub-meter Data Hub Operator in the sphere of an Energy Service Provider	Data Provider	A party that has the mandate to provide information to other parties in the energy market.

[3] https://mwgstorage1.blob.core.windows.net/public/Ebix/Harmonised_Role_Model_2020-01.pdf

EU-SysFlex Work Package 5		HEMRM v2020-01	
Business Roles	Descriptions	Business Roles	Descriptions
Data Owner	Any person who owns data and can give authorization to other parties to access them. Can be, inter alia: • Flexibility Services Provider • Market Operator • Consumer • Generator	Not available	
Data User	Any person who uses data. Can be a Data Owner or a Data Delegated Third party.	Not available	
DEP Operator	Data exchange platform operator owns and operates a communication system which basic functionality is data transfer.	Not available	
DER Operator	Operates a single DER unit. Distributed Energy Resources can consist of generation sources, energy storage facilities and facilities participating in Demand Response. Are mainly connected to distribution power grids but can also be connected to transmission power grids (e.g. Portugal). Can be an Asset Operator, a Generator or a Generation Asset Operator (cf. definitions in T3.3 deliverable).	Resource Provider	A role that manages a resource and provides production/consumption schedules for it, if required.

EU-SysFlex Work Package 5		HEMRM v2020-01	
Business Roles	Descriptions	Business Roles	Descriptions
Energy Service Provider	A party offering energy-related services to any other party (adapted from ENTSOE-EFET-ebIX harmonized role model). An energy service provider (ESCO – energy service company) is a market-based role which is responsible for delivering energy services to the customers (or to other parties on behalf of the customers). In case these services necessitate the access to customer's data, the consent of this customer is required. Examples of the executors of this role include aggregator, flexibility service provider, energy efficiency provider, energy monitoring provider. This role does not appear in T3.3 Business Use Cases. Can also be an Aggregator or a Generator (cf. definitions in T3.3 deliverable).	Energy Service Company (ESCO) covers a part of Energy Service Provider responsibilities.	A party offering energy-related services to the Party Connected to Grid, but not directly active in the energy value chain or the physical infrastructure itself. The ESCO may provide insight services as well as energy management services.
Flexibility Service Provider	Can be a Distribution Network Flexibility Provider or a Transmission Network Flexibility Provider (cf. definitions in T3.3 deliverable). Similar to Flexibility Aggregator. Can be both aggregator and individual consumer/generator. Type of Energy Service Provider.	Balance Service Provider covers a part of FSP responsibilities.	
Foreign Customer Portal Operator	Customer Portal Operator in another country. Can also mean an operator of a separate customer portal in the same country.	Not available	

EU-SysFlex Work Package 5		HEMRM v2020-01	
Business Roles	Descriptions	Business Roles	Descriptions
Market Operator	A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity (cf. ENTSOE-EFET-ebIX harmonized role model 2020). In EU-SysFlex project, a market operator not only trades electricity but also flexibility services. Organizes auctions (continuous auctions, discrete auctions, calls for tender) between buyers and sellers of electricity-related products in the markets, and more generally publish the corresponding prices, for assets connected to a power grid. Manages/operates the platform for trading (where bids and offers are collected). Clears the market and communicate results. (cf. definition in T3.3 deliverable)	Market Operator	A market operator is a party that provides a service whereby the offers to sell electricity are matched with bids to buy electricity. Additional Information: This usually is an energy/power exchange or platform.
Metered Data Operator	Provides metered data to authorized users in a transparent and non-discriminatory manner	Metered Data Responsible	A party responsible for the establishment and validation of metered data based on the collected data received from the Metered Data Collector. The party is responsible for the history of metered data for a Metering Point.
Optimization Operator	Optimise and select the bids, where relevant in combination with switching measures; clear the market for auctions or select individual bids in the order book organised by the MO taking into account the grid data (constraints and sensitivities/topology if needed) provided by DS_O and TS_O ; communicate results (rewarded offers and prices) to the MO. The OO role can be carried out by a system operator, market operator or a third party. (cf. definition in T3.2 deliverable)	Not available	
Primary System Operator	Initiates the call for tenders or initiates the activation of a flexibility.	A kind of System Operator	(see System Operator)

EU-SysFlex Work Package 5		HEMRM v2020-01	
Business Roles	Descriptions	Business Roles	Descriptions
Secondary System Operator	Operates the power grid on which a flexibility service unit is connected or this unit may otherwise impact its grid. Assesses the impact on its network of the flexibility to be procured by Primary System Operator because the activation of such flexibility may potentially cause congestion in its grid.	A kind of System Operator	(see System Operator)
System Operator	System Operator means a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity (cf. ENTSOE-EFET-ebIX harmonized role model 2019). Can be: • A Transmission System Operator (cf. definition in T3.3 deliverable), for frequency control, congestion management and voltage control on transmission network, • A Distribution System Operator (cf. definition in T3.3 deliverable), for congestion management and voltage control on a distribution network. NB: In some countries (e.g. Germany and Poland), the high voltage network is part of the distribution grid and in other countries (e. g. France and Italy) the high voltage network is part of the transmission grid. A System Operator is called: • A Primary System Operator, • A Secondary System Operator.	System Operator	A party responsible for operating, ensuring the maintenance of and, if necessary, developing the system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution or transmission of electricity. Additional information: The definition is based on DIRECTIVE 2009/72/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, Article 2 (Definitions)

TABLE 1: BUSINESS ROLES INVOLVED IN DATA EXCHANGE SYSTEM USE CASES WITH HEMRM CORRESPONDENCES

The HEMRM describes a model identifying all the roles that can be played for given domains within the electricity market. It also identifies the different objects that are necessary in the electricity market for information exchange. HEMRM has made use of the UML class diagramming technique. It uses two UML symbols, the “actor” symbol and “class” symbol.

For Work Package 5 work, the complete set of UML concepts is not needed either. IEC 62559 standard leads us to use a reduced set of notions (e.g. Business Roles, System Use Cases) and explicitly defines them (see IEC 62559 parts 1 and 2).

IEC 62559 may evolve in the future and integrate several ongoing actions dealing with UML, Archimate, SGAM (Smart Grid Architecture Model) and IRM (Interface Reference Model) mentioned in IEC 61968 standard. But IEC 62559 standard is already aligned with several well-known standards, such as TOGAF (an Open Group standard), and IEC 62559 concepts can be quite easily mapped to the SGAM. Similarly to UML Use Cases written with Modsarus plugin and compliant with IEC 62559, UML SGAM models can be written with the SGAM Toolbox, a free plugin produced by the University of Salzburg for Sparx Enterprise Architect.

7. CONCLUSION

Task 5.2 data exchange SUCs describe how systems can be used by Business Roles to exchange data. They involve Business Roles coming from:

- Task 3.2,
- Task 3.3 on the basis of Work Packages 6, 7 & 8 demonstrators,
- Work Package 9 for data management.

This analysis can contribute to the high-level architecture of a data exchange model expected in sub-task 5.1.10. It gives relevant information on the Business Roles to be represented in the Business Layer of a SGAM model.

Most of these identified Business Roles can be mapped to the HEMRM. The other ones are listed below and reflect the new business and IT needs and could be reported to ENTSO-E, EFET and ebIX®.

EU-SysFlex Work Package 5	
Business Roles	Descriptions
Authentication Service Provider	Trust authority. Verifies the identity of authenticating parties. Some countries will have their own authentication service provider. For countries which will not, there may be a more global and to be defined one.
Customer Portal Operator	Operates a Customer Portal.
Data Delegated Third party	Any natural person who has received representation rights from a data owner.
Data Owner	Any person who owns data and can give authorization to other parties to access them. Can be, inter alia: • Flexibility Services Provider • Market Operator • Consumer • Generator
Data User	Any person who uses data. Can be a Data Owner or a Data Delegated Third party.
DEP Operator	Data exchange platform operator owns and operates a communication system which basic functionality is data transfer.
Flexibility Service Provider	Can be a Distribution Network Flexibility Provider or a Transmission Network Flexibility Provider (cf. definitions in T3.3 deliverable). Similar to Flexibility Aggregator. Can be both aggregator and individual consumer/generator. Type of Energy Service Provider.
Foreign Customer Portal Operator	Customer Portal Operator in another country. Can also mean an operator of a separate customer portal in the same country.
Optimization Operator	Optimize and select the bids; clear the market for auctions (organised by the MO) or select individual bids in the order book (organized by the MO) taking into account the grid data (constraints and sensitivities/topology if needed) provided by DS_O and TS_O; communicate results (rewarded offers and prices) to the MO. The OO role can be carried out by a system operator, a market operator or a third party.

TABLE 2: BUSINESS ROLES TO BE ADDED TO HEMRM

8. COPYRIGHT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under EC-GA No 773505.