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Deliverable D 1.5 V2X Use Cases Repository

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Disclaimer

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¹ <https://ev4eu.eu/>

Executive Summary

Vehicle-to-everything (V2X) use cases (UCs) repository is the final output of the work conducted in task 1.5 - Use case specifications of the Horizon Europe EV4EU project, led by INESC ID. This task aimed to define the specifications of the business UCs (BUCs), addressing the business relationships between different stakeholders. These BUCs will be tested in the EV4EU project demonstration sites. The deliverable D1.5 aims to present the V2X UCs repository and to provide the direct link to the file.

Electric vehicles (EVs) are emerging as a solution to reduce the impact of transportation sector in the environment. Several challenges need to be addressed during the transition between traditional internal combustion engine vehicles to new electric ones. One of the challenges of the EV mass adoption is the integration in power systems. The use of EVs will increase the energy demand and the peak consumption. However, EVs also introduce a new source of flexibility that can be managed by system operators both at transmission and distribution levels.

Considering the different roles of the stakeholders, we developed a V2X UCs repository with seven BUCs based on the new business models defined in deliverable D1.4 - Business models centred in the V2X value chain, and the needs and goals of the EVEU demonstrators. The proposed BUCs follow the standard methodology proposed by International Electrotechnical Commission (IEC), allowing a faster replicability and adoption by different stakeholders. The BUCs identified were: BUC1) Participation of V2X in Electricity Markets through a Virtual Power Plant, BUC2) System level V2X/Renewable Energy Resources (RES) Coordination, BUC3) Participation of V2X in Explicit Demand Response to Congestion Management Service, BUC4) Participation of V2X in Implicit DR to voltage control and V2X/RES coordination in distribution system, BUC5) Participation of V2X Managers in Dynamic Contracts to support DSO operation, BUC6) Participation of V2X in local Flexibility Markets, and BUC7) Participation of V2X in frequency regulation services.

The repository has been developed in Sparx Enterprise Architecture® software, version 13 with Modсарus® plugin, and it has been shared in the EV4EU GitHub public community. The repository was developed considering the Use Case Methodology proposed in IEC 62559-2:2015.

Table of Contents

Executive Summary	4
Table of Contents	5
List of Figures.....	6
Acronyms.....	7
1 Introduction.....	8
1.1 Scope and Objectives	8
1.2 Structure.....	8
1.3 Relationship with other deliverables	8
2 EV4EU Business Use Cases	9
3 Conclusions.....	11
4 References.....	12

List of Figures

Figure 1 – EV4EU Business Use Cases 9

Acronyms

BUCs	Business Use Cases
DSO	Distribution Service Operators
EVs	Electric Vehicles
EV4EU	Electric Vehicle Management for carbon neutrality in Europe
FOs	Flexibility operators
IEC	International Electrotechnical Commission
RES	Renewable energy resources
TSO	Transmission System Operators
UC	Use Cases
VPP	Virtual Power Plants
V2X	Vehicle – to – Everything
WP	Work Package

1 Introduction

1.1 Scope and Objectives

The deliverable D1.5 - V2X Use cases repository presents the V2X UCs repository and provides the direct link to the file. The V2X Use Cases repository specifies the BUCs to be tested in the EV4EU demonstrators installed in the four European countries participating in the project: Denmark, Greece, Portugal, and Slovenia. The BUCs identified in the repository are associated to the use of EVs flexibility to provide services to transmission system operators (TSOs), distribution system operators (DSOs) and flexibility operators (FOs), also known as virtual power plants (VPP).

The proposed BUCs resulted from several discussions conducted in dedicated workshops under the EV4EU project. The aims of this work were:

- i. to propose the BUCs allowing the use of EVs flexibility by different stakeholders;
- ii. to identify the roles of different stakeholders allowing the use of EVs flexibility;
- iii. to identify the business objects allowing the identification of the information exchange needs between stakeholders;
- iv. to identify the objectives and key performance indicators allowing the measurement of the proposed business cases success.

1.2 Structure

This document is structured in three chapters. Chapter 1 presents the deliverable D1.5 aims, structure and relationship with other deliverables. Chapter 2 presents the V2X BUCs repository and provides the direct link to the file, accessible through EV4EU GitHub community. Finally, Chapter 3 concludes the document.

1.3 Relationship with other deliverables

Deliverable D1.5 is the output of the EV4EU Task 1.5 – Use Case Specifications, and is based on Deliverable D1.4 – Business models centred in the V2X value chain [1]. Together with D1.4, D1.5 served as a basis for identifying information exchange needs and barriers addressed in D5.1 - Information Exchange needs to enable different UCS [2]. D1.5 is also the basis for the algorithms and methods to be developed in work packages (WPs) 2, 3, 4 and 5, and the BUCs identified in D1.5 will be tested in the demonstration WPs 6, 7, 8 and 9.

2 EV4EU Business Use Cases

The V2X Use Cases repository is comprised of seven BUCs. Each BUC considers the different roles of the stakeholders involved, shown in Figure 1.

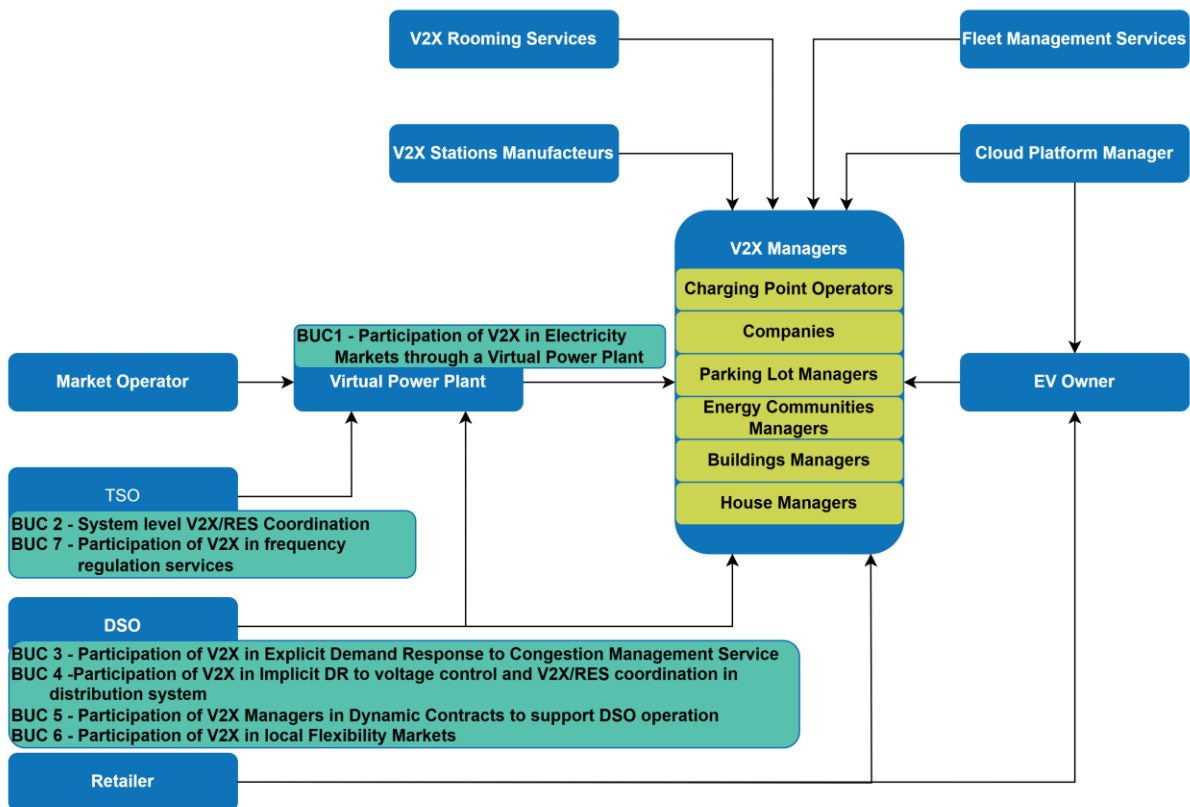


Figure 1 – EV4EU Business Use Cases considering the different roles of the stakeholders

The BUCs present in the repository are:

- BUC1 - Participation of V2X in Electricity Markets through a Virtual Power Plant;
- BUC2 - System level V2X/RES Coordination;
- BUC3 - Participation of V2X in Explicit Demand Response to Congestion Management Service;
- BUC4 - Participation of V2X in Implicit DR to voltage control and V2X/RES coordination in distribution system;
- BUC5 - Participation of V2X Managers in Dynamic Contracts to support DSO operation;
- BUC6 - Participation of V2X in local Flexibility Markets;
- BUC7 - Participation of V2X in frequency regulation services.

The BUCs were modelled using the *Sparx Enterprise Architecture*[®] software, version 13, a visual modelling and design tool widely used to model systems and business processes using UML format, with *Modsarus*[®] plugin, an open licence tool developed by EDF R&D² for *Sparx Enterprise Architecture*,

² <https://sparxsystems.com/products/3rdparty/frameworks.html>

that allows to generate and transform the Use Cases into UML models. The repository was developed considering the Use Case Methodology proposed in IEC 62559-2:2015 [3].

The repository has been shared in the EV4EU GitHub public community³. The direct link to access the V2X Use Cases repository is:

https://github.com/EV4EU/BusinessUseCases/blob/main/EV4EU_T1.5_V1.eapx

³ <https://github.com/EV4EU>

3 Conclusions

The deliverable D1.5 provides the link to the V2X Use Cases Repository file, shared through the open EV4EU GitHub community.

This repository consists of seven BUCs that will be tested in the EV4EU demonstration sites located in Denmark, Greece, Portugal, and Slovenia. The BUCs are: BUC1) Participation of V2X in Electricity Markets through a Virtual Power Plant, BUC2) System level V2X/RES Coordination, BUC3) Participation of V2X in Explicit Demand Response to Congestion Management Service, BUC4) Participation of V2X in Implicit DR to voltage control and V2X/RES coordination in distribution system, BUC5) Participation of V2X Managers in Dynamic Contracts to support DSO operation, BUC6) Participation of V2X in local Flexibility Markets, and BUC7) Participation of V2X in frequency regulation services. The BUCS have been developed in Sparx Enterprise Architecture® software with Modsarus® plugin.

This repository is the output of task 1.5 – Use Cases Specifications, led by INESC ID.

4 References

- [1] M. Zajc et al., “Deliverable 1.4: Business models centred in the V2X value chain”, Ref. Ares(2023)2360646, Electric Vehicles Management for carbon neutrality in Europe (EV4EU) Horizon Europe funded project, grant agreement 101056765, 2023.

- [2] M. Zajc et al., “Deliverable 5.1: Information Exchange needs to enable different UCs”, Ref. Ares(2023)1469491, Electric Vehicles Management for carbon neutrality in Europe (EV4EU) Horizon Europe funded project, grant agreement 101056765, 2023.

- [3] IEC International Electrotechnical Commission Webstore, “IEC 62559-2:2015 Use case methodology – Part 2: Definition of the templates for use cases, actor list and requirements list”. International standard.
Available online: <https://webstore.iec.ch/publication/22349>.