Green eMotion

Development of a European Framework for Electro-mobility

Deliverable 3.3

Business Services
Use cases and Requirements
Release 1

Prepared by:

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List of Abbreviations

API	Application program interface	**KPI**	Key Performance Indicator
B2B	Business to business	**LV/MV**	Low voltage / Medium voltage
CA	Consortium Agreement	**MPO**	Metering Point Operator
CDR	Charge detail record	**MSP**	Measurement Service Provider
CH	Clearinghouse	**NOC**	Network Operations Center
CP	Charge Point	**NPE**	Nationale Plattform Elektromobilität (German initiative)
DoW	Description of Work (Annex I of Grant Agreement)	**OEM**	Original Equipment Manufacturer, i.e. Electric Vehicle manufacturer
DSO	Distribution system operator	**PHEV**	Plug-in electric vehicle
EOC	End of charge	**RES**	Renewable energy source
ESB	Electricity Supply Board	**RFID**	Radio frequency identification
ETA	Estimated time of arrival	**SDR**	Service detail record
EV	Electric vehicle	**SECC**	Supply Equipment Communication Controller
EVCC	Electric Vehicle Communication Controller	**SLA**	Service level agreement
EVSE	Electric vehicle supply equipment	**SOC**	State of Charge [%]
EVSP	Electric vehicle service provider	**TOU**	Time of use
G4V	Grid for vehicle (EU research project)	**TSO**	Transmission System Operator
GeM	Green eMotion	**V2G**	Vehicle to grid
HMI	Human machine interface	**V2H**	Vehicle to home
ICT	Information Communication Technology	**VPP**	Virtual power plant
IMS	Infrastructure management system	**WP**	Work Package

Executive summary

This deliverable comprises the requirements of e-mobility organized through shared information platform(s): The Green eMotion Marketplace eco-system. Partners from relevant e-mobility related industries participating in this work package (WP3) have defined services, which are from their perspective most likely to be used in the demo regions during the first and second release. These services were suggested by GeM partners because of their high added value, their early market adoption, their business oriented perspective as well as the user acceptability.

The results of the stakeholder analysis and surveys from D3.1 were described as high level business scenarios and were with the use of applied meta-model transformed with increasing granularity to features and use cases described in the D3.3 deliverable. These requirements will be further detailed by IT developers in the specification phase leading to the first release of the Marketplace demonstration.

The Structured Requirements Management Method with the use of the IBM Rational Requirements Composer (RRC) was the main methodology used in this deliverable. Work package partners identified Features (business and core marketplace services) to consequently realize them through Use cases with acting Actors.

Deliverable D3.3 is a comprehensive export from the RRC tool and its 76 services (Features) are described by 98 Use cases grouped in 6 chapters:

Charging services – described in Chapter 2 and lead by Betterplace and Siemens include 32 business services divided in sub-chapters: 6 before charging, 2 identification, 13 during charging, 1 after charging, 7 driving, 3 cross domain.
From the end user perspective the timeline of the charging cycle seemed crucial to determine the division of services into those the user will be interested in before connecting its vehicle to a charging point, during the charge and afterwards. Before charging services such as search and navigation to a suitable EVSE are described. Services during and after the charge are expected to include communication with the end user about the status of battery, control of charging by third parties, monitoring and collection of charge related data.

Driving Services in chapter 3 describe additional services labeled as "driving services" include basic end user functionalities as vehicle tracking, use of EV parking spaces without charging, monitoring and CO2 analysis reporting. In addition, extended services such as fleet management and intermodality planning are described in this chapter.

Roaming services – described in Chapter 4 and led by SAP (7 business services)
The GeM Marketplace facilitates also information exchange that enables geographic roaming between countries and roaming either between EVSPs and EVSPs or EVSPs and EVSE Ops.. Roaming is based on contractual clearing services performed by the "Clearinghouse", which is a third party application accessible through the GeM Marketplace. Contractual clearing enables intra-country and inter-county roaming through the validation of contracts between different EVSE Operators and EVSPs as well as their respective customers. This functionality is of key importance to the Green eMotion project because it enables charging at different EVSEs with the use of a single contract provided by one EVSP. During its first release the Clearinghouse application will only provide roaming and authorization services. Future releases of the Clearinghouse may also provide Financial Clearing, which would improve financial and billing operations for e-mobility.

Energy services - described in Chapter 5 and lead by Enel (13 business services).

The ability to centrally modulate or to short term disconnect the EVSE of charged electric vehicles for the purpose of congestion management is of main concern to the WP3 energy partners. This scenario considers the possibility of leveraging the smart metering backbone of the conventional electricity grid, or directly the smart recharging infrastructure in case of a newly developed e-mobility market, when embedded smart metering functionality is deployed. These services refer to a nationwide environment and adopt a de-localized recharging infrastructure management system or IMS. A variation of how these services may run is based on decentralized congestion management as a value added business service (not depicted in this document). Similarly (non-binding decentralized approach) but from the energy trading and quality perspective the services of synchronized flexible EV load (virtual power plant) and ancillary services were described. All these services could be offered through the Marketplace by aggregators in the long term and by DSOs in the short term and pragmatic scenarios (before the aggregation market takes off), together with EVSE Ops, and, based on the local legislation, activated / bought by DSO, TSO, or the nearest balance responsible party. V2G concept is also described in this deliverable but its full deployment is not expected during the first release of the Marketplace.

Core/platform marketplace services – described in Chapter 6 and lead by IBM (22 platform services). Core / platform services enable the functioning of the Marketplace and facilitate stakeholders to offer and request business services described in Chapters 2-4. The core marketplace services domain describes the essential services to run the marketplace itself. It covers mainly the functionality to offer services by service providers and the use of those services by service requesters, referring typically to the terms "Buying" and "Selling". These terms are processes that can be divided in sub-processes described in the core service chapter. Marketplace services are crucial to effectively realize the business services with the use of GeM Marketplace.

This deliverable comprises about one hundred requirements, which are considered by major e-mobility stakeholders to be of high value and easily adopted by the emerging e-mobility market. Once they become tangible through the first release of the Marketplace, their potential will be proven by the demo regions of Green eMotion. Variations and enhancements of these requirements will be implemented in the next releases of the Marketplace.

Note: To achieve efficient retrieval of desired content from this comprehensive deliverable please refer to section "How to read this document" at the end of the Introduction chapter.

1 Introduction

This deliverable provides, in form of structured ICT requirements, a thorough description of the initial, yet high value Marketplace services, which will be starting point of further evaluation for demonstration in the regions. The almost one hundred use cases described in this deliverable shape the first reference architecture of the Marketplace and outline the business interactions around it from the Charging, Roaming and Energy perspective.

How was the Marketplace eco-system created, where do we stand and what are the next steps?
Prior to the design of the Green eMotion's Marketplace, a thorough analysis of previous electric mobility demonstrations and their IT approaches have been performed in task 3.1 (Stakeholder ICT Requirements and Business Analysis). The first high level requirements were documented as Business scenarios in the deliverable D3.1 and transformed to specialized requirements tool to leverage its reusability and lessons learned. In depth survey of the expectations of internal and external stakeholders provided that no basic requirements were omitted. This Deliverable is enabling a holistic goal definition of the overall system to be produced. In its current form, D3.3 represents the first phase of structured description of Marketplace requirements and its IT characteristics will be further detailed in the specification phase. The content and interactions of D3.3 features and use cases will be further enhanced in the second phase (requirements for the 2 release of the Marketplace), multiple variations and alternative services are expected to be documented based on the feedback of the partners and demo regions after their experience with the first release. Second phase of the requirements will be similarly as the current phase further detailed by the IT developers during the second specification phase, which will lead to a second release of the Marketplace.

Deliverable D3.3 is based on a tool used within the project. Herewith the re-use of content for all partners in WP3 is possible. The document itself is a comprehensive export document, requiring the reader to understand its structure to be able to retrieve desired information efficiently. Read the table at the beginning of each chapter to search for the service and then refer to the table of contents for its location. For detailed information, and for hints on efficient retrieving of content please refer to the section “How to read this document” at the end of this Introduction chapter.

To facilitate the requirements gathering process, 4 functional domains were derived from the stakeholders (WP3 partners) expertise areas. The structure of this document reflects this classification of requirements. A more detailed description of the grouping and hierarchy of the requirements by their context are presented in this introductory chapter separately in the section “Division into functional domains”.

Two distinct methodologies were used to define these groups of requirements:

- Structured Requirements Management Method on IBM Jazz platform[1] with the use of Rational Requirements Composer (RRC)[2]. Led by IBM, 4 working groups identified features (business and core marketplace services) and further detailed them through use cases.
- Interactions from the user perspective were defined using the Usability Engineering Method. Led by Siemens, a series of workshops resulted in a task case map around the Core services.

The results of both methodologies were integrated in a final workshop, and additional requirements were documented in the RRC tool making it the sole repository of the collected requirements. A more detailed description of the two methodologies is presented in the Methodology sections of this chapter.

To conclude, the D3.3 deliverable comprises functional aspects of e-mobility under the assumption of the use of shared information platform(s), the GeM Marketplace eco-system. Partners from relevant e-

[1] Hosted environment with access for WP3 Partner

[2] Rational Software by IBM was provided to all WP3 Partners as part of the project

mobility related industries participating in this work package (WP3) have defined services, which are from their perspective most likely to be used in the demo regions already during the first release. These services were suggested because of their high added value, and their expected early market adoption and user acceptability. In the next releases of the Marketplace, however, it is expected that new services and transactions will emerge and numerous variations of the current D3.3 requirements will occur.

1.1 Division of requirements into functional domains

One of the main values of Green Emotion is the combination of multiple perspectives on e-mobility. This involves not only the different regional perspectives within Europe, but also the perspectives from different stakeholders, as was recognized clearly in deliverable D3.1. The key objective of Work Package 3, and as such this deliverable, is to develop and implement a European marketplace that enables clearinghouses and service providers to interact and do business, and to develop and implement interfaces to support these B2B business relations. A European-wide market place and clearinghouses do not yet exist. The purpose of Work Package 3 is both to develop and implement such solutions but also to demonstrate regional ongoing and upcoming implementations of marketplaces, clearinghouses, service providers etc. Both objectives are equally important. This deliverable is reflecting the development, implementation and demonstration plans at regional as well as European level.

For release 1 of the Marketplace, the WP3 sub-teams accommodated this by distinguishing four Functional Domains for developing the requirements. IBM formed four working groups, each involving multiple stakeholders but led by a party with strong background in the specific domain:

- Charging Domain working group was led by Betterplace and Siemens
- Driving Domain was teamwork and derived by the use of a structured approach in RRC
- Roaming Domain working group was led by SAP
- Energy Domain working group was led by Enel
- Marketplace Domain working group was led by IBM

Although these domains are inseparable for EV, and contain substantial overlap, this approach made it possible to create substantial progress in a short time frame. The coherence was achieved by joint working sessions and by the participation of stakeholders across all working groups. This structure is also clearly visible in the design of this document.

The **Charging Domain** is described in Chapter 2. This domain contains a large variety of features with a natural grouping based on the phasing of the extended charging process. To improve readability, Chapter 2 is divided into separate sections for Before Charging requirements (search for Charging Point, reserve, navigate), Authorization, During Charging requirements (monitoring, communication with driver, control of load), After charging (analysis).

The **Driving Domain** of Chapter 3 describe common features like parking management, vehicle tracking and others which include on the end user side intermodality planning (extended search beyond e-mobility) and also on the business to business side fleet management and CO2 reporting.

The **Roaming Domain** is elaborated in Chapter 3, describing both geographic roaming between countries and roaming between EVSPs. Roaming is based upon contractual clearing services performed by a "Clearinghouse" - in this context a third party application, accessible through the GeM Marketplace. In the first release the Clearinghouse provides roaming authorization services only. A future Clearinghouse may also provide Financial Clearing, supporting efficient financial and billing operations for EV. The Roaming Domain chapter contains separate sections for each of its main Features.

The **Energy Domain** is described in Chapter 5 and covers mainly business to business value added services, for which the grid operator is the main beneficiary. The dominant scenario is centralized congestion

management as performed by Enel in Italy: a service that may instantaneously reduce the amount of power that is drawn from the electricity grid to prevent outage. Other services in this domain involve using aggregated and controllable EVSE load (and V2G) to provide ancillary services or regulating power to the TSO. The chapter is divided into sections by Features as realized by scenarios, no further grouping into sub-chapters is applied.

The **Marketplace Domain** is described in Chapter 6. This is the only domain defining Core services, the technical enablement to the business services described in Chapters 2,3,4 and 5. By nature this domain is more technical than the other domains. This is also the main area of impact for the User Interaction requirements, which were catalogued using a special methodology, described in Section 1.3.

1.2 Methodology - Structured Requirements Management

In D3.1 the WP3 team developed of a series of high level Business scenarios for EV charging and the related information flow, based upon the collected best practices and lesson learned from previous European projects.

This collected content was gathered from multiple resources, such as other projects' deliverables, interviews, group calls, and workshops. To use this information for the creation of the marketplace, various aspects such as roles, rules, dependencies, and purpose of the scenarios must be clearly defined and well structured. For this purpose WP3 has adopted the Structured Requirements Management Method, with the use of dedicated tooling, the Rational Requirements Composer (RRC).

In D3.3, the WP3 team described the high level **Business scenarios,** divided them into **Features** and realized these features by comprehensively described **Use cases.** These artifacts and the relations between them form the **basis of the meta model**:

- **Business scenario** - high level description of a possible business services with the use of the Marketplace, its actors, value drivers, costs.
- **Feature**- textual description of each of the business services of a scenario. Features describe high level product/component functionality.
- **Use case**- describing the interaction of actors towards the system; comprehensive elaboration of Features describing goal, scope, successful outcome, possible failures, work-flow, and possible variations.

Rational Requirements Composer Tool[3]

The use of the RRC tool helped to increase the Green eMotion Project WP3 team's requirements gathering efficiency in three distinct ways:

1. Eliminate wasteful effort and rework:
   To avoid wasteful efforts and rework, the RRC requirements definition helped to avoid the compounded cost of rework from duplicate efforts and lack of document version control due to documents being passed around the team.

2. Respond quickly to dynamic business needs:
   Grouping of documents into defined sets and maintain that relationship over the course of the project enabled the WP3 team to work in secure repositories, to collaborate more effectively with stakeholders and to customize groups of related requirements (artifacts) into collections or modules for better, quicker organization and retrieval of information.

[3] Rational Requirement Composer (RRC) is a IBM Software Product

3. Deliver high-quality products and applications with confidence:
   When documents and spreadsheets are used to define and manage requirements at the beginning of the project, teams often lack a method for assessing the status of the requirement and if it has truly been implemented. The RRC enabled WP3 sub-teams to gain visibility into project progress and status, and was tightly integrated with the quality management process.

Several examples on how the RRC tool interfaces look like can be found in a figure below.

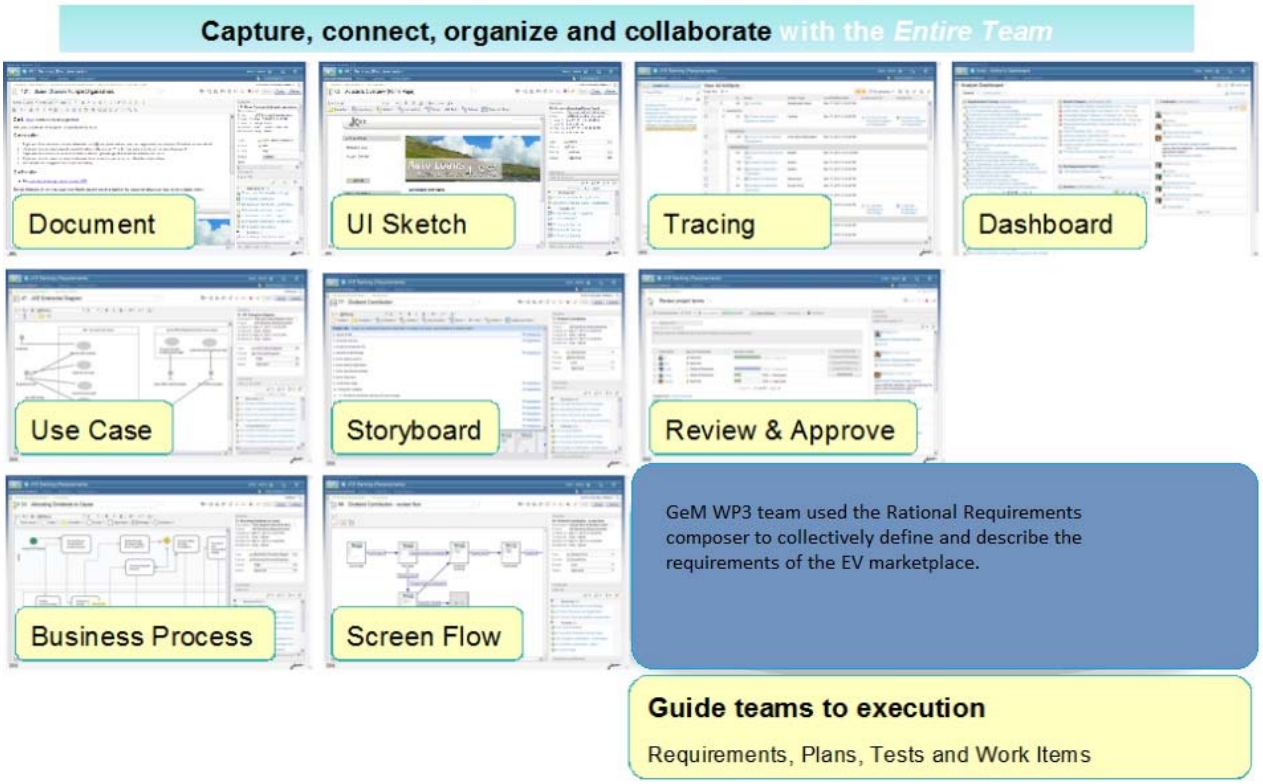


Figure 1 Structured Requirements Management

At the beginning of the team work, the WP3 team attended three conference calls to get acquainted with the Rational requirements composer (RRC), the meaning and purpose of the artifacts and the meta model. Using a work-flow based on the meta model, the scenario's from D3.1 were enhanced and broken down into contextual blocks, and Features (what must a component be capable of), Business Objects (sources or carriers of information) and Business Rules (logic constraints on the scenario's) were added. In many cases Business Process Diagrams were created to document and explain the more complex scenarios.

The Features were then allocated to WP3 partners (assigned ownership of content) to further detail each Feature into one or more Use Cases. To ensure involvement of all partners, four WP3 working groups were formed each addressing one functional domain: Charging, Roaming, Energy and Marketplace. The current deliverable is based upon the same Domain structure

The Use Cases are the most comprehensive descriptions of single business (sub)processes; they effectively specify how a feature will be realized. For some groups of Use Cases, the coherence and interactions are illustrated by a Use Case Diagram. These diagrams are particularly useful for the system archi-

tects during the detailed specification phase of the Marketplace. Where applicable, any Non-functional requirements such as security, performance and scalability are documented together with the use case. Generic Non-functional requirements have also been documented separately in the RRC tool.

The following picture illustrates the requirements gathering and the links between the artifacts of the meta model.

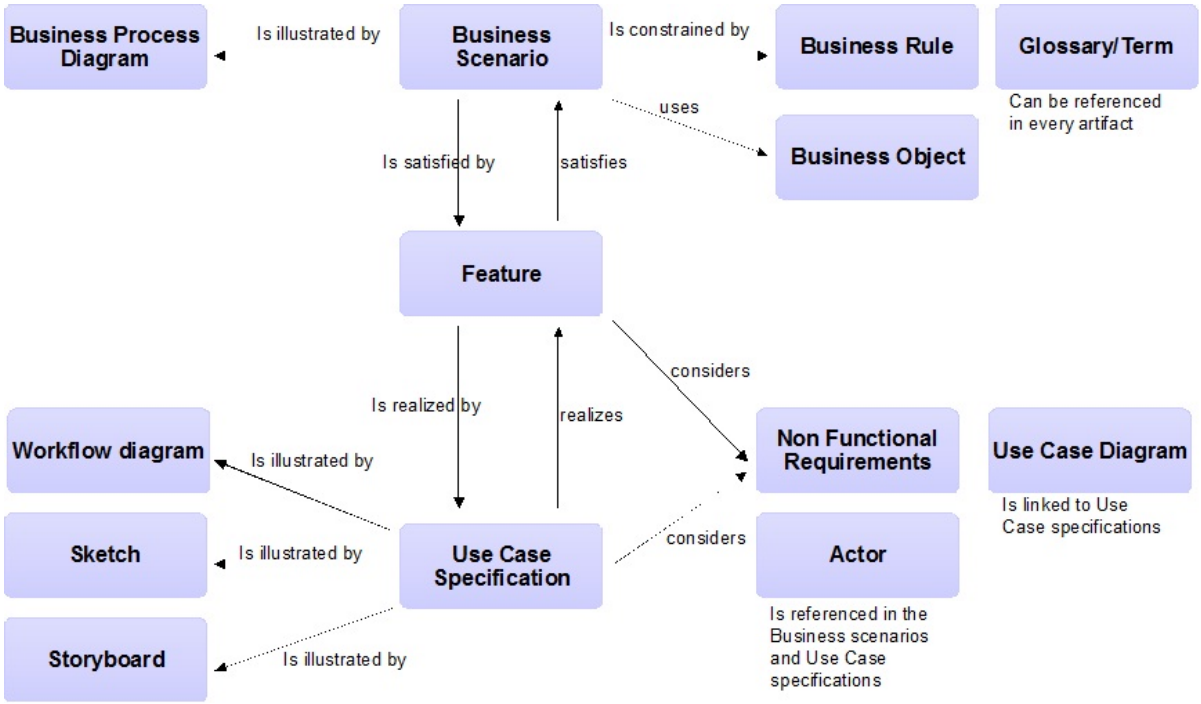


Figure 2 Requirements gathering - Artifacts and Relations

1.3 Methodology - Usability engineering method

To speed up, validate, and enhance the quality of the top-down Structured Requirements Management approach, the WP3 team selected the Usability Engineering Method. This also helped to improve mutual understanding amongst the great variety of Stakeholders, coming from very different cultural and industrial backgrounds.

Four workshops were conducted following the Usage Centered Design process as developed by Constantine and Lockwood (1999). To ensure that all implicit and explicit knowledge was available, all stakeholders took part in these workshops, and the knowledge captured in the RRC tool was accessible during the workshops. Participation also covered all development roles, including domain experts, business developers, requirements engineers, software developers, architects and usability experts.

Led by the Usability Engineers, the workshops delivered a system model of the future software, as well as high-level User Interface design (sketches). These results were integrated into the requirement specification in the RCC tool.

The Usability Engineering Methodology

The usability activities start with analyzing the actors and the tasks they need to perform with the future software, as illustrated by the following picture.

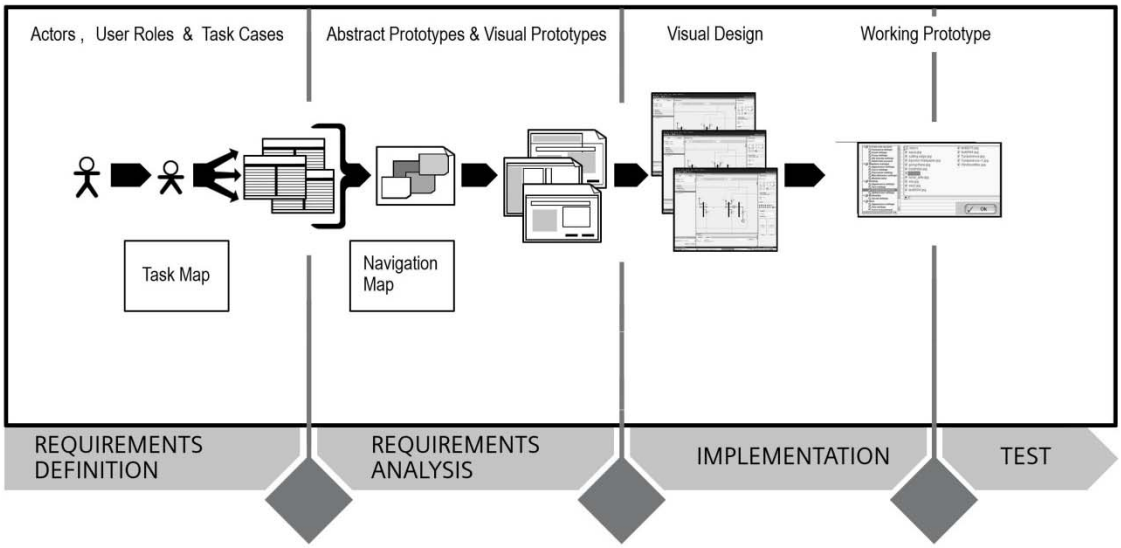


Figure 3 Usability Engineering Methodology

In this methodology, Actors are persons (human beings, no system actors) using the future software, such as “network operators”. User roles describe the relationship between the software and the actor, for example, “monitoring energy network.” The identification of actors and roles allows us to verify that the requirements are complete and enables us to decide on the essentials needed for the future system.
Task cases are performed by the actor in roles. The task case models the “what” and “why” of the software use rather than the “how.” Task cases are comparable to essential use cases as they focus on the essentials of the requirements. Each task case describes what the user wants to do in order to fulfill the task (user intention) and what the future software needs to do to support task completion (system responsibility). Task cases are abstract, simplified, and technology-free. The description allows the project team to focus on the essential user needs resulting from the task. The technical feasibility is examined in later steps for enabling innovative solutions.

Tasks are grouped into so-called task clusters. These clusters are a pre step for the future user interface and they show which tasks (functionality) are grouped together on one screen/mask. The relationship between the task clusters from the end user point of view is documented in the navigation map.

The knowledge of the actors and their tasks is the foundation for discussions related to the software requirements and functional scope. This output is used for requirement specification and development planning (e.g. several phases, which requirements, which features will be realized in which phase) which serves as input for architecture and software development.

References to this section:
Constantine, L., and L. Lockwood. 1999. Software for Use: A Practical Guide to the Models and Methods of Usage-Centered Design. New York: ACM Press.

1.4 How to read this document

The WP3 team suggests the following approach to reading this document:

1. Read the introduction first
2. 2.Select the functional domain of interest
   a). If looking for general impression read each chapter introduction for an overview
   b). If looking for a particular service read the second section of each chapter for overview of actors and also the sub-section for the list of described services and their use cases (e.g. for chapter 3 read 3.2 and 3.3.1). Please note that chapter 2 has sub-chapters, than the overview of services is at the beginning of every sub-chapter (2.3.1, 2.4.1).
3. Select the features (service) of interest and either continue into the chapter or refer to table of contents to see the page number where the feature description and its use cases start
4. To search for a particular use case you can refer to appendix, which lists all use cases in order as they appear in the document.

The Document is primarily divided to chapters by logical grouping of features / services to which the order of Use cases is subordinated. Use cases are always described in the chapter where they appear for the first time, when the same use case realizes a different feature in a chapter later in the text, a reference is made to the first instance.

The Appendix includes a complete list of 98 use cases organized by the chapters in which they are fully described (their first occurrence). Each chapter starts with table overview of actors and services / features, followed by detailed use case descriptions realizing the features.

There are 75 services, structured in 5 chapters as follows:

- Charging services (22 Services) - Use case tables marked in Red color
- Driving and Cross (11 Services) Domain Services – Use Case tables marked in Purple color
- Roaming services (7 Services) - Use case tables marked in Green color
- Energy services (13 Services) - Use case tables marked in Yellow color
- Core/platform marketplace services (22 Services) - Use case tables marked in Orange color

For easy reference to the Business Analysis (Deliverable 3.3) the Services are listed in alphabetical order in Appendix F, together with the Business Scenario they support.

2 Charging functional domain use case model

2.1 Overview

This chapter is the most complex in both content and structure and includes the highest number of features(28 out of 76). The working group was represented by a variety of industries ranging from automotive OEM, through energy to IT and e-mobility services. Companies that participated in creating the Charging domain requirements include Better Place, BMW, Daimler, RWE, SAP, Siemens and IBM. The core of this chapter, the cycle around connecting, charging and disconnecting an electric vehicle was provided by Better Place.

The working group defined basic and value added end user services from the scenarios described in the 3.1 deliverable of GeM.

There are three main charging scenarios forming this domain. It is the basic charging, its enhanced functionalities and the different charge locations, which can be at home, semi public (in offices, shopping centers) or public (at curbside).This domain covers all kinds of services that give the EV driver access to recharged batteries, including slow charging, quick charging and battery switching.

The following picture illustrates the relations among these three groups of scenarios.

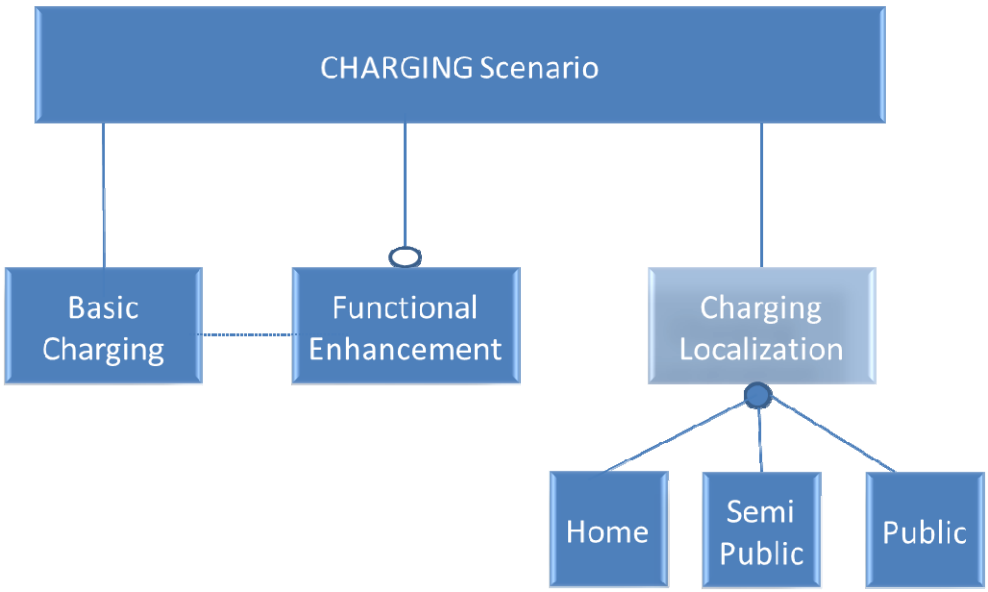


Figure 4 Structure of the Charging Domain

When considering the end user perspective and the timeline of the charging cycle we have decided to cluster most of the charging features around three main phases of the charging process to obtained three groups / sub-chapters. The First group of features / services includes those that the end user is interested in before connecting his vehicle to a charging point, services related to a search and navigation to a suitable EVSE.

The Second group of services includes those that are related to the actual process of a particular charge session from the moment of connecting the vehicle to the charging point until and including its disconnection. These services include communication with the end-user about the status of charge, control of charging, monitoring and collection of charge related data.

The Third group of features is formed by the services that summarize charging sessions and includes analytics and reporting about service consumption, these are described in an After Charging use case. Between the first (Before Charging) and the second (During Charging) phases there may be an identification and authorization use case. In some implementations this use case would belong to the During Charging use case (e.g. Better Place). Additional services labeled as "driving services" include basic end user functionalities such as vehicle tracking, use of EV parking spaces without charging, monitoring and CO2 analysis. In addition, extended services such as fleet management and intermodality planning are described in this chapter.

All these services are described as functional requirements. For lack of implementation experience with these services, the WP3 team decided to postpone the definition of non-functional requirements until the specification phase.

The “connect-charge-disconnect” cycle is illustrated in the following picture *(Source: Better Place)*.

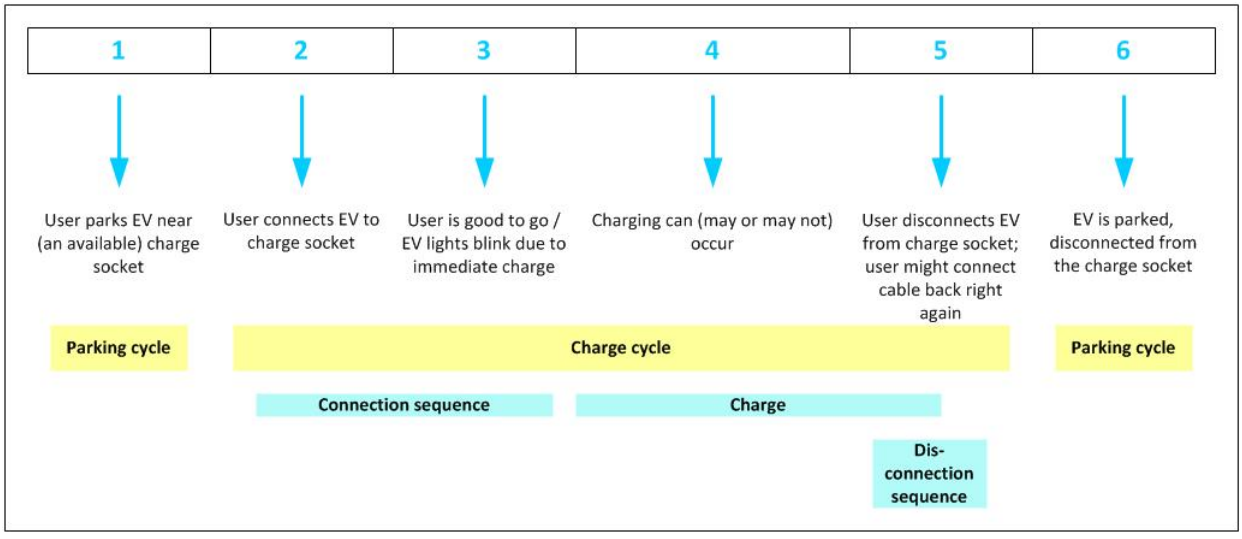


Figure 5 The Connect - Charge - Disconnect cycle

2.2 Actors

The following table lists the identified Actors in the Charging domain.

ID	Actor	Description
140	ACT Clearinghouse	authenticates and processes contractual and financial transactions
129	ACT DSO Distribution system operator	Provides the power connection point to the charging spot.
143	ACT EV (Electric Vehicle)	Provides access to the vehicle data
131	ACT EVSE (Electric Vehicle Supply Equipment)	is used to exchange energy between the EV and the Grid
1406	ACT EVSE Backend	Backend, administrative systems of the EVSE Operator, as opposed to frontend, on-site systems that communicate directly with EV's
132	ACT EVSE Operator	in charge of managing the EVSEs
128	ACT EVSP (Electric Vehicle Service Provider)	offers e-mobility services to the end customers
1594	ACT Fleet manager	Organization that manages a fleet of EV's
1407	ACT EVSP Backend	Backend, administrative systems of the EVSP
1540	ACT HMI Human Machine Interface	interface allowing the vehicle user to receive information relative to the charging process and provide input to the charging system
136	ACT Marketplace Operator	Operates the platform and communications, and manages access to and working of the marketplace
134	ACT OEM	Manufacturers of electric vehicles and charging equipment
135	ACT Public sector	EU commission, National government, local government, municipalities
1541	ACT SECC Supply Equipment Communication Controller	implements the communication to one or multiple EVCCs
137	ACT Service Provider	Business Partner that offers and sells EV Services on the marketplace
138	ACT Service Requester	Business Partner that consumes EV Services on the Marketplace
1579	ACT Third Party Service Provider	An actor which provides access to third party data
133	ACT Vehicle Driver	Human, currently driving the Vehicle

Table 2.1 Charging Domain – Actors

2.3 End user services before charging

2.3.1 Before Charging - Overview

Business services described in this chapter support the first part of the charging cycle, the time before the driver parks his car and connects the EV to a charging point.

The area in the red square on a figure below illustrates the part of the cycle timeline, where these services occur.

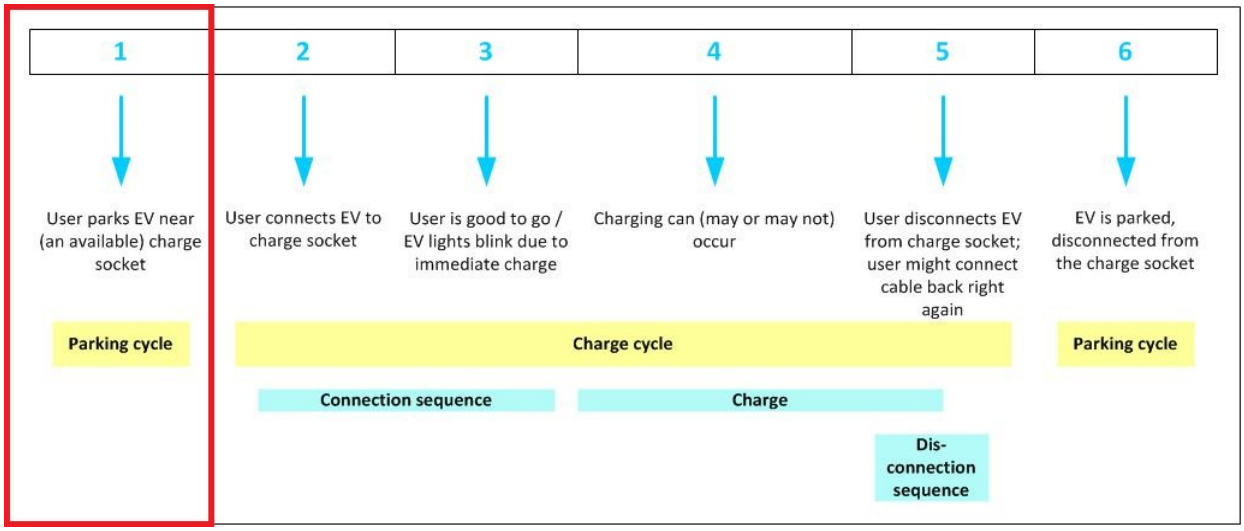


Figure 6 Scope of Before Charging

End user perspective

Basic end user services in this sub-chapter include the possibility to set charging preferences (renewable energy, flexible (interruptible or reduced charge if rewarded by lower price), charge with commercial offers nearby, charge with free parking, search for EV designated parking but no charging, etc.). These preferences would be stored by the EVSP in the driver's user profile and made available to other service providers either directly by the EVSP or through a Marketplace. Based on these settings, or pre-defined preferences, the driver is before each trip offered tailored search results with likely preferred charging points. This should be communicated through a very simple user interface and is comparable to today's planning of the route through GPS. Several constraining characteristics, such as the weight and size of the car, type of plug, type of battery charge (AC/DC, fast/ normal combination) are considered during the optimized search.

Business to business perspective

From the service provider's perspective, there are several useful value added services optionally available via a Marketplace. This may include the current location of the driver to obtain an updated ETA, selected parking lot, average amount of energy charged while parking, minimum service level granted to particular EV by the EVSP, etc. Legal constraints may apply in different countries.[4]

[4] This may lead to a variant of the specific use case (Inheriting Artifacts) with specific constrains. The major case should be interoperable throughout Europe

Marketplace context

The before charging services described in this chapter are not exhaustive and number of similar services are expected to be offered in the future by service providers directly or through Marketplaces. Currently these services satisfy Business scenarios described in the Charging and OEM domain through the features listed in the table below (section 2.3.2). The main use case of this section is 1510Before charging, and is complemented by several additional use cases, which realize the same features.

The following table lists the Features that are relevant in the “before charging” phase (ref 2.1).

Features		Use Cases	
917	FTR Basic enhanced charging	1510	UC Before charging
918	FTR Enhanced charging	1527	UC Search for EVSE
1278	FTR Identification of available EVSE	1528	UC Reservation of EVSE
1296	FTR Third party information	1574	Third party information
969	FTR EVSE Charging capabilities		
978	FTR Search for charge point (or battery switch station)		
1318	FTR Reservation of Charge Spot		

Table 2.2 Before Charging - Features and their Use Cases

Several interactions between these actors as are illustrated in 1200 BPD Enhanced charging, please refer to Appendix B.

2.3.2 Before Charging – Feature Content

917 FTR Basic enhanced charging

Driver can search, either by using in-vehicle device or mobile phone, for EVSEs based on specified input, e.g.:

- Current location of driver
- Driver's destination
- Car and infrastructure capabilities: AC charging, DC charging, battery switching

918 FTR Enhanced charging

Driver will be able to:

- Check availability
- Search for the best price
- Obtain optimized suggestion based on his profile (cost, time, environment)

1278 FTR Identification of available EVSE

The driver uses app, on-board unit or customer service hotline to identify available EVSE when on the road

1296 FTR Third party information

This feature comprises the usage of data provided by third party data providers for value added services. Services like searching, reservation or routing may be enhanced by these data.

969 FTR EVSE Charging capabilities

This feature comprises information of an EVSE's charging capabilities in order to display only compatible EVSE options to the driver.
The information should reflect the EVSE's charging capabilities:

- AC charging
- DC charging
- Battery swapping

Tasks in the feature:

- Define a format for infrastructure capabilities
- Define APIs to retrieve infrastructure capabilities
-

978 FTR Search for charge point (or battery switch station)

This feature allows a driver to make a search of charge spots or battery stations within specified geographical area or route. A search can be made from multiple devices, e.g. on-board device, app, internet.

1318 FTR Reservation of Charge Spot

This feature of reserving a charge spot entails:

- A user uses the on-board device, app, internet or similar devices to request a reservation of a charge spot through a service provider
- The service provider validates the user request through EVSE operator or through clearing house
- The service provider confirms or rejects the user request

Driver will be able to make a reservation of EVSE:

- One time
- Recurring
- When available (during a day, week, year)

2.3.3 Before Charging - Use Case(s)

The details of this content are described in the following Use Case(s)

2.3.3.1 1510 UC Before charging

Scope & Level	Basic end-user services. This use case covers the phase from identifying the need for charged EV batteries, through making the charging decision, planning the route to the arrival at the selected or reserved charging location. The use case describes interaction between an EV driver and a device that is connected to a service provider. The EVSP might provide its services to the EV driver based on the interaction with other service providers directly or via the Marketplace
Goal in context	An EV driver can select a satisfactory EVSE location and find his way to it. EV driver may use services such as route planning, identification of available EVSE, charging location reservation, etc., and access these services through a compatible on-board interface (telematics, mobile app, phone call to a customer service center or similar) with a service provider.
Preconditions	• An on-board interface to a service provider • The service provider provides own services or services of other service providers via the marketplace or bilateral agreements with these service providers • The services are delivered to the EV driver through interaction between EV driver and on-board device that is connected to an EVSP. This may require the

	EVSP and an EVSE operator or marketplace to interact with each other. • The provider may provide a service through access to certain information about the driver and the EV, e.g. user-ID, contract information, EVSE and car charging capabilities, car position etc. This information can be retrieved from various actors; car, driver, EVSP and EVSE operator. • The user is confronted with updated information, e.g. on charge prices or charge spot availability		
Successful outcome	• Select between recharging options (AC chargers, DC chargers or battery switch station) that are compatible and can be filtered by user's current location, destination and a preferred route • Check availability of charge spots, prices, and optimized suggestions based on user's profile • Apply eco-routing • Arrive at the EVSE location		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Search failure	User is not able to identify requested service	• Technical errors • Typing errors • Connectivity • Other
	Outdated or false information about: • Charge prices • Charge point availability • Route information • Charge sites • Other	The user is offered services based on outdated or false information	• Service provider fails to track or update real-time information • User fails at making software updates • Other
Primary actor	133: ACT Vehicle Driver 1406: ACT EVSE Backend 1407: ACT EVSP backend		
Secondary actors	140: ACT Clearinghouse 128: ACT EVSP (Electric Vehicle Service Provider) 136: ACT Marketplace Operator 132: ACT EVSE Operator		
Main scenario	• Search for EVSE • Selection of EVSE • Route guidance to EVSE • Arrival at EVSE		
Alternatives	User plans route and charging "unconnected".		
Variations	This use case contains a package of basic end user and value added services (e.g. reservation). In day-to-day operation the user may only choose part of the offered services, which shall be processed as well.		
Related information	-		
Issues	Security and privacy		

2.3.3.2 1527 UC Search for EVSE

Scope & Level	EVSE search includes functions (attributes of EVSE) such as: • Geographical information (e.g. actual location of the e-car, planned location for travel / reservation) • Actual availability status (e.g. free, occupied, reserved, out of order, maintenance) • AC charger, DC charger or battery switch station • Type of plug: (e.g. Type 2 / 3 / household) (optional mapping with characters from EV) • Charging power (e.g. 32 ampere) (optional mapping with characters from EV) • Phases: 1-phased or 3 phases • Access: EVSP/EVSE(e.g. RWE, Better Place) membership, open access • Special energy attributes: (e.g. green energy, nuclear energy) • Price: Per kWh, Per hour parking, fixed fee etc. • The search function can be supported from different end-user applications: o Smart Phone (e.g. iPhone, Android) o Internet customer portal o In-Car application (e.g. onboard-unit) The result can be shown on a Geo-Map (e.g. Google-Maps, Bing, Teleatlas) or/and in a text-table. All relevant information (e.g. address, charging plug) has to be included.		
Goal in context	An EV driver wants to search for an EVSE location in order to increase range of the vehicle. The goal of this use case is to enable the EV driver to select from multiple recharging attributes and filter his search by these.		
Preconditions	• The EVSEs have a communication to a backend system of the EVSE operator e.g. Charging management system / Infrastructure management system (IMS) • The EVSEs have a unique ID (grid ID) • Access to data about the EVSEs (e.g. type of station, type of plug, charge power, exact location, prices, services, energy source) EV driver application is integrated		
Successful outcome	Find a suitable EVSE		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSE location cannot be found	No charging point available	• No communication to charging point • Inconsistent data-scheme
Primary actor	133: ACT Vehicle Driver		
Secondary actors	131: ACT EVSE (Electric Vehicle Supply Equipment) 128: ACT EVSP (Electric Vehicle Service Provider)		
Main scenario	• Entering search criteria for charging points (e.g. address) • Show result, that mean information about selected charging points		
Alternatives			
Variations	The search functionality will vary from service provider to service provider. The combination of search functionalities is endless and cannot fully be described		
Related information	This use case enhances (is embedded in) the UC 1510 before charging. • Search of EVSE requires a fast system response (response time < 3 seconds)		
Issues			

2.3.3.3 1528 UC Reservation of EVSE

Scope & Level	Value added service The search function can be supported from different End user-Customer applications: • The result can be shown on a Geo-Map (e.g. Google-Maps, Bing, Teleatlas) or/and in a text-table. All relevant information (e.g. address, plug type etc.) have to be included. • To reserve an EVSE the EV driver has to choose a suitable EVSE and then reserve the relevant time frame. • The reservation function can be with costs from the EVSP / EVSE for the EV driver. • To confirm the reservation of the EVSE, the EV driver receives a confirmation message per email, sms or similar. The reservation function can be supported from different end user / customer devices: • Smart Phone (e.g. iPhone, Android) • Internet-Customer-Portal • In-Car application (e.g. onboard-unit)		
Goal in context	EV driver is able to reserve a selected EVSE, through available interfaces for a desired period of time. E.g. driver wants to reserve a charging point in advance in order to charge the EV. This enables extended-range journeys with increased confidence.		
Preconditions	• EVSE has a communication to a backend system (e.g. Charging Management System or Infrastructure management system (IMS)) • EVSE has a unique ID (grid ID) • EVSE master data (e.g. plug type, phases, address) are available • EVSE master data entails an option to allow reservation • EV driver is supported by an EVSP with an application that entails an option to reserve		
Successful outcome	Reservation of an EVSE.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	No reservation of an EVSE		The EV driver can't reserve an EVSE.
Primary actor	133: ACT Vehicle Driver		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 131: ACT EVSE (Electric Vehicle Supply Equipment)		
Main scenario	• Entering of search criteria (e.g. address) • Show result of search criteria, that information about selected charging points and availability for reservation • Reservation of EVSE (optional payment process) • Confirmation of reservation		
Alternatives			
Variations			
Related information	For the reservation of an EVSE the EV driver has to search for the EVSE. This use case enhances (is embedded in) the UC 1510 before charging. • Reservation of EVSE requires a high and fast system performance (complex algorithm and response time < 3 seconds)		
Issues	System performance		

2.3.3.4 1574 UC Third party information

Scope & Level	Value added service. The City pilot service within the EVSP backend uses information from third party providers to adapt the search results regarding to the personal preferences of the EV driver. Possible preferences are e.g.: • Points of Interest (POI) • Favorite chains • Special sales • Special events (concert, movie) Preferences can be combined with options to fine tune the search result. Possible options are e.g.: • Time of the day • Season • Traffic news • Timetable of public traffic • Weather forecast This use case is linked to the search for CP (UC 1527), which is embedded in the before charging use case (UC 1510).		
Goal in context	An EV driver wants to search for a Charge point (EVSE) in order to charge the EV or for short time parking. The EV driver uses his end user customer application to connect to the city pilot service of his EVSP. This use case enables the search for a Charge point (EVSE) to combine personal preferences of end user and information from third party providers.		
Preconditions	• EVSP offers a city pilot service, which combines personal preferences and information from third party providers • The EV driver has a (roaming and city pilot) service contract with an EVSP • The EV driver has configured personalized preferences by using his EVSP account • The EVSP has a special knowledge base to store the preferences • The EVSP has direct contracts with several third party providers (e.g. traffic supervision, shopping malls, office of public transportation, tourist information, weather service)		
Successful outcome	The EV driver will be provided with a list of available Charge points (EVSE). The stations will be sorted or highlighted dependent from the accordance with the personal preferences. Additionally, the reasons for recommending selected stations can be returned, e.g. as a link to an event or sales description.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	No Charging point is available	The EV driver will be provided with an empty list.	• No communication to Charge point (EVSE) • Inconsistent data-scheme • No charging point is available within the search area
Primary actor	133: ACT Vehicle Driver- interacts as described in the main scenario		

Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 1579: ACT Third Party Service Provider
Main scenario	• EV driver requests a Charge point (EVSE), based on personal preferences and current third party information • EV driver uses his end user customer application to connect to the city pilot service of his EVSP • EV driver will be provided with a list of available Charge points (EVSE), sorted by his preferences
Alternatives	
Variations	
Related information	
Issues	

2.4 Identification and authorization of EV user

2.4.1 Identification and authorization - Overview

The following table lists the Features that are relevant in the “Identification and authorization of EV user” phase (ref 2.1).

Features		Use Cases
563	FTR User identification	1502 UC EV Identification, Authentication and Authorization
979	FTR Authentication of user	

Table 2.3 Identification and Authorization - Features and their Use Cases

2.4.2 Identification and authorization - Content

This feature group comprises the following content:

563 FTR User identification

Depending on the EVSE infrastructure and the capabilities of the EV, the methods of identifying a user differs.
The figure below classifies possible scenarios:

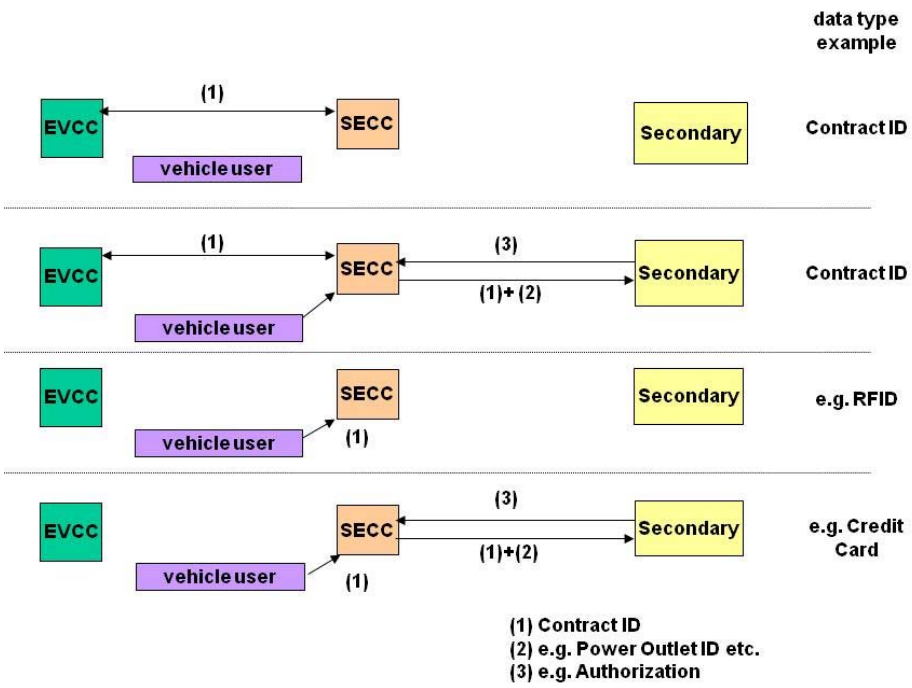


Figure 7 User Identification Scenario's, Source ISO 15118-1

The following figure illustrates the communication when a visitor (in this figure subscriber) requests charging services from an EVSE operator (in the figure Charge Network Operator) from the perspective of Better Place:

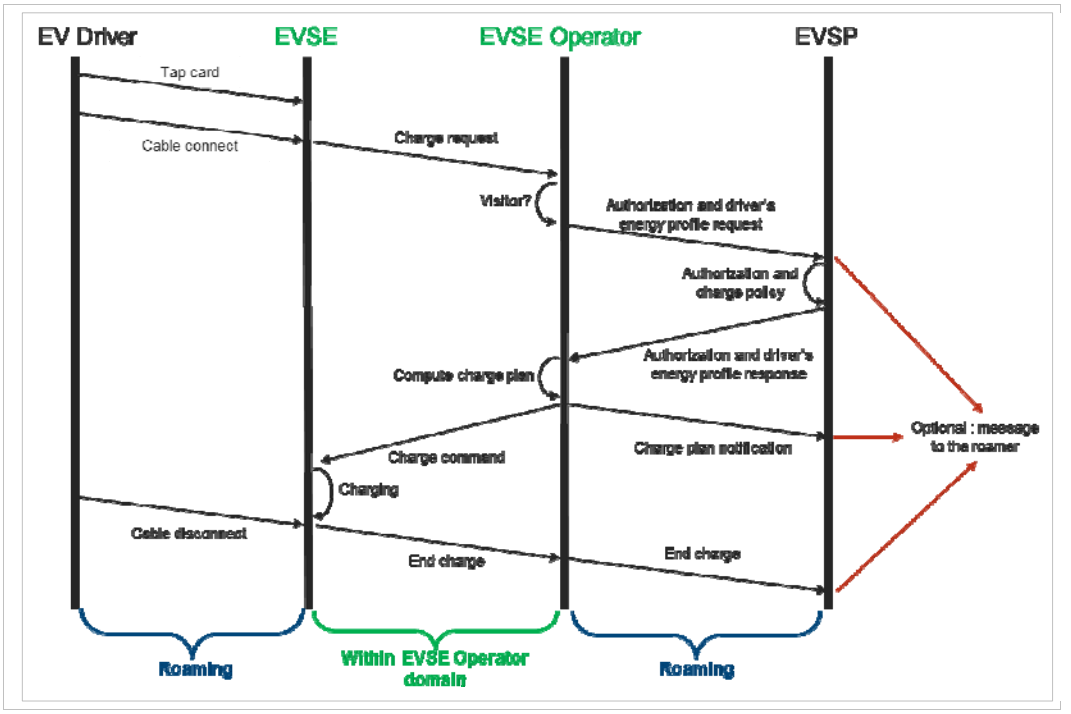


Figure 8 User Identification as implemented by Betterplace

A visitor taps his RFID card to access charging services from an EVSE. The slot opens and he connects the car and the EVSE with a compatible cable. A charge request is send to the local EVSE operator, either automatically or with certain specified services by the visitor (e.g. priority charge). The EVSE operator can identify that it is a visitor. The EVSE operator asks the EVSP of the visitor (in a case of bilateral agreement between the two) to authorize the customer and to specify his service level. This allows the EVSP to inform his customer about the authorization. Based on authorization and service level, the EVSE operator creates a charge plan. While the plan is send to the EVSP the charge session commences. The EVSP can then inform the customer about the charge plan. During the charge session, when the charging ends the EVSE operator creates a transaction report (how much is charged? How much time? etc.) and a session report (why did it end?).

Authorization

Depending on the EVSE design, many authorization methods are thinkable in the future. However, all authorization methods could be categorized by means of authorization location and authentication.
Authorization covers all methods for services rendered to the client. It includes the payment for electricity supplied to the vehicle and the authorization to receive a requested value-added service. Payment for electricity concerns relatively small amounts, other services (e.g. car rental) may concern larger amounts and may require supplementary security.

With authorization, the vehicle user shall be identified in any way to start the charging process. Outside the EV, i.e. a phone call or an External Identification Means may be used at the paying unit (EVSE) for authentication. Inside the vehicle, a unique authentication code is transmitted between EVCC and SECC to identify the vehicle user.

With this clustering of the authorization methods they can be classified into four types:
- authorization with authentication,
- authorization without authentication
- authorization inside the EV.
- authorization outside the EV.

These authorization options are an indicator of possible implementations in the field.
In some cases charging service may be permitted without an authorization process:
EXAMPLE: At a car park where parking fees could include the energy consumption of the vehicle or charging at domestic household socket.

A similar situation is also referred to as Open Access by Better Place: 1701 FTR Open access to EVSE

979 FTR Authentication of user

This feature allows for an EVSE operator to give a user access to an EVSE from tapping an RFID card or other compatible ID (ISO 15118). The feature involves the following:
- Driver uses a compatible ID to access EVSE
- If the EVSE recognizes the driver, either as customer or roamer, access is given
- EVSE starts charging the car
- If the EVSE operator cannot validate the user, charging will be interrupted

2.4.3 Identification and authorization - Use Case(s)

The details of this content are described in the following Use Case:

2.4.3.1 1502 UC EV Identification, Authentication and Authorization

Scope & Level	Basic end-user services. This use case covers identification of contract belonging to a user (own customer or roamer) at a charge spot or battery switch station, and his authentication and authorization to execute the process of charging or battery switching). Use case describes the interaction between EV/ EV driver, EVSP, EVSE operator and optionally the Clearinghouse (when roaming).
Goal in context	The goal of this use case is to enable the EVSE operator to authorize the EV driver to use EVSE services (charge or replace battery, etc.) and determine the payment details.
Preconditions	• Communication between SECC and EVCC shall be established successfully • The customer can identify himself • Online connection between SECC and EVSE operator is required. • Connection between EVSE operator and EVSP directly or through clearing-house

Successful outcome	Authentication and authorization process is successful, a session ID is defined and the required service (charging or value added) starts.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Authentication process fails, no authorization given by the secondary actor.	The required service does not start.	User might be informed about the reason for failure (i.e. contract has expired, contract has been blocked, stolen car or contract, procedure to be restarted, identification server not available).
Primary actor	143: ACT EV (Electric Vehicle) 1539: ACT EVCC Electric Vehicle Communication Controller 131: ACT EVSE (Electric Vehicle Supply Equipment) 1541: ACT SECC Supply Equipment Communication Controller 1540: ACT HMI Human Machine Interface 133: ACT Vehicle Driver		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 140: ACT Clearinghouse		
Main scenario	User connects the car to the station and activates the service offering the ID. This could also be done automatically. SECCand EVCCexchange their IDs (e.g. Contract ID). Those are forwarded to the secondary actor for validation. The secondary actor replies with an agreement or non-agreement Service starts after successful authorization of the IDs		
Alternatives	-		
Variations	EVSE Operator and EVCC may exchange information (e.g. Contract ID) directly.		
Related information	A user can have multiple contracts.		
Issues	Security and privacy		

2.5 Services during charging (EV connect – disconnect)

2.5.1 During Charging - Overview

Business services described in this chapter support the charging cycle, between the moment when the driver parks his car and connects to a charging point to the time when he disconnects and physically leaves the parking space. At the implementation of these services in different demo regions, there is expected some overlap between During charging and After charging service described in the next section.

In the figure below, the area in the blue square illustrates the part of the charging cycle timeline during the charging process.

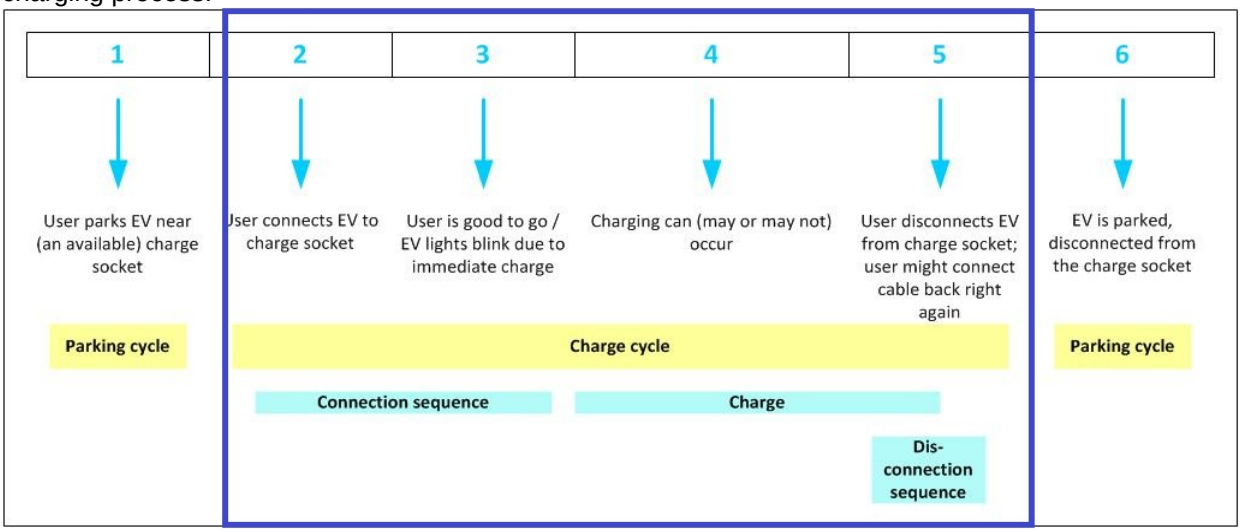


Figure 9 Scope of "During Charging"

End user perspective

These basic end user services that take place during charging include the instructions on how to park and connect, telematics that navigate how to switch battery, trigger priority charge, communication with the driver, e.g. sms to a mobile phone when change in charging occurs, alerts, signals, etc. but also securing the minimum service level of the end user (communication between the EVSP who EV driver has an SLA with and EVSE operator that provides charging services) and roaming services. It depends on the implementation whether the identification is also realized during phase or we consider it already performed by a separate use case in between the before and during charge.

Business to business perspective

From the service provider's perspective, there are several useful value added services optionally available via a Marketplace. This may include the change of the speed of charge, interrupted charging, provision of current charge information, theft protection, etc.

Marketplace context

During charging services described in this chapter are not exhaustive and plentiful of similar services are expected to be offered in the future by service providers directly or through Marketplaces. Currently these services satisfy Business scenarios across the Charging, OEM and Energy domains through the features

listed in the table below. The overarching use case of this section is defined as **1502** During Charging, and is complemented by **several use cases**, which realize the same features.

The following table lists the Features that are relevant in the "Services during charging" phase (ref 2.1).

Features		Use Cases
1358	FTR Connect-Charge-Disconnect	1518 UC During charging
956	FTR Battery switching	1502 UC EV Identification, Authentication and Authorization
1701	FTR Open access to EVSE	
564	FTR SLA	
561	FTR Priority charging	
562	FTR Low priority charging	
950	FTR Charging as guest	
1702	FTR Charging monitoring	
1357	FTR Charge data collection	
951	FTR Charging report	
976	FTR Charging management	
1299	FTR Charge point management	

Table 2.4 During Charging - Features and their Use Cases

Several interactions between these actors as are illustrated in 1200 BPD Enhanced charging, please refer to Appendix B.

2.5.2 During Charging - Feature Content

1358 FTR Connect-Charge-Disconnect

This feature describes the process from a user connects a car to a car is once again disconnected

- A user parks his car by a charge point
- The user identifies himself with a compatible ID (RFID, scan, phone call to customer service center etc.)
- The user is authenticated and can connect the car to the charging with a compatible charge cable
- A signal (beep, green light, combination of the two or similar signal) from the EVSE indicates that cable and car is now connected properly and that charging may occur
- User is authorized or not for charging. If not, the charging is interrupted and the user is notified
- The charging will now be executed according to charge plan. Effectively, this means that charging may or may not continue immediately depending on dictated charge plan
- User disconnects car from charge point

956 FTR Battery switching

Facility offering customers battery switching services:

- A customer identifies himself with RFID or alternative user identification
- The telematics system instructs the user to park the car correctly in the switch station
- Upon correctly parking an automated process takes over the car positioning, washing and battery switching
- The telematics system informs the user when the automated switch process is over and the car can be removed from the switch station

1701 FTR Open access to EVSE

This feature comprises the service of an EVSE operator offering EV drivers access to charging services without being a customer of the particular EVSE operator or being supported by a roaming agreement. This could be:

- EV drivers with a contract with an EVSP that does not involve roaming services from the particular EVSE operator or
- EV drivers that do not have an EVSP contract at all. In these cases it can be necessary (e.g. due to local regulations) to offer the EV driver access to recharging services.

This is referred to as "open access". This access can be granted in different ways, e.g. remote access granted by using apps, phone call to EVSE operator, pre-paid cards etc.
Payment can be settled in various ways depending on the open access solution implemented.

564 FTR SLA

After a customer is identified at an EVSE the SLA between EVSP and customer dictates:

- minimum service level (e.g. sufficient charging to drive to the next Charge Point or battery switch station)
- roaming y/n
- value added services

561 FTR Priority charging

The EV driver can request a "priority charge" using a compatible communication link to the EVSP (mobile app, telematics, sms etc.). The EV driver will receive a request confirmation or denial based on EVSE operator approval.

562 FTR Low priority charging

An EVSE operator is requested by EVSP or clearing house to lower the charging priority of a customer based on a customer's SLA.

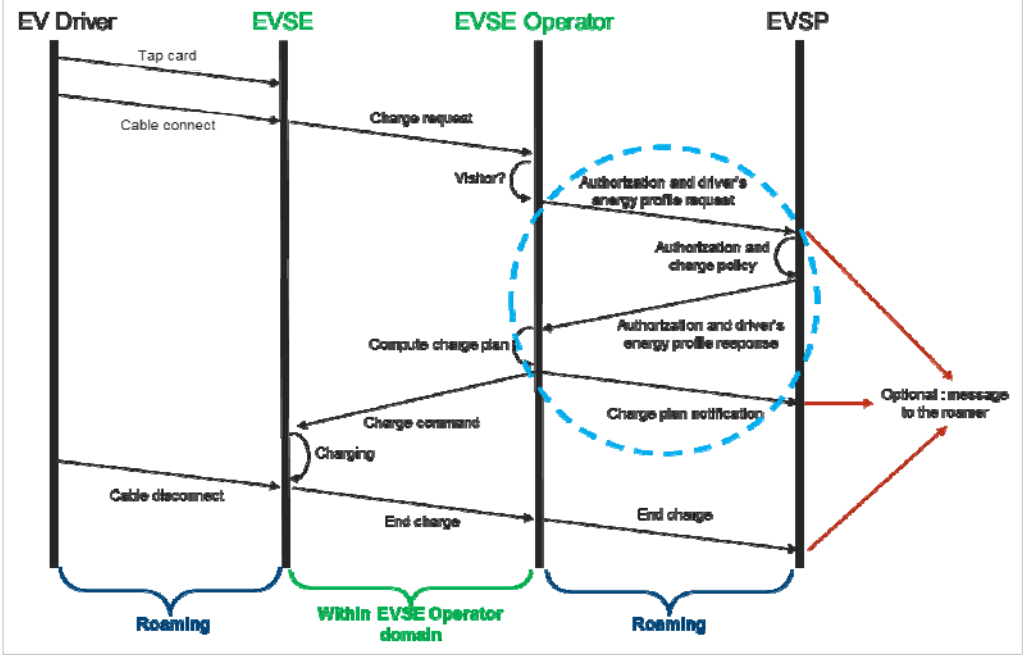


Figure 10 Low priority charging, as implemented by Betterplace

The circle on the illustration above shows how the features “SLA”, “Priority charge” and “Low priority” are settled between two operators in a roaming scenario in the case of Better Place.

950 FTR Charging as guest

Allow guests to charge their EV at home charger

1702 FTR Charging monitoring

This feature comprises the EV drivers’ ability to monitor different aspects of the charge process while it is connected to an EVSE, e.g. state-of-charge, time left to by fully recharged etc.
The EV driver can consume the service through various interfaces, apps, website, on-board device etc.
Charging monitoring can be facilitated in various ways. One way is through a mobile connection between the EV's on-board device and EVSP back-end system.

1357 FTR Charge data collection

- Uploading charge data from EVSE to fulfill the processing (OEM, EVSP)
- Type of data harvested: ID, SLA, Car capabilities, CO2

951 FTR Charging report

The end-customer receives charging report through app, sms or on-board unit after charging informing on latest energy consumption

976 FTR Charging management

The feature allows control of charging. Who is in control of managing the charging depends on the business model. In some cases the charging will be controlled by the user, in some cases by a service provider and in some cases a combination. This feature involves the most basic charging management characteristics:

- Increase load
- Decrease load

1299 FTR Charge point management

This component is needed as a sub service of charging location management. It allows status-monitoring and charge point reservation and acts as the access layer to charging location management.

2.5.3 During Charging - Use Case(s)

The details of this content are described in the following Use Case(s):

2.5.3.1 1518 UC During charging

Scope & Level	End-user services. This use case covers the enhanced connect - charge - disconnect cycle (FTR1358) with additional services. Use case describes interaction between EV driver, EVSE Backend and optional 3rd parties (Energy trader, DSO, public sector) **Note** that Identification, Authentication and Authorization is a separate Use Case (UC 1502) but parties may choose to implement UC 1502 between the Before and During charging use cases.
Goal in context	The primary goal of this use case is to acquire a sufficient EV battery state of charge. Secondary goals may include use of services related to charging or battery

<table>
<tr><td></td><td colspan="3">switching, such as control of charge, priority charge, cost optimized charge, communication (progress report), etc.</td></tr>
<tr><td>Preconditions</td><td colspan="3">• EVSE operator can identify a driver and the driver can access the charge point (or switch station)
• Interoperability in place (hardware as well as communication)
• Charging is controlled by EVSE operator based on a charge profile created by a number of variables (standard level agreement with customer, grid constraints, State of Charge, etc.)</td></tr>
<tr><td>Successful outcome</td><td colspan="3">• Optional: User identified and granted or denied access to Charge Point or battery switch station (ref 1502 UC) may be implemented within the connect-charge-disconnect cycle (e.g. Betterplace)
• EVSE operator manages charging (or battery switch) successfully according to charge profile
• User is validated or denied access to further service
• User is continuously notified in real-time about charging status (start, stop, error, SOC, time to finish etc.)
• Control of charge (reduced, interrupted, deferred charging) based on the input from the EVSP or third party is performed by the EVSE operator
• EVSE operator is able to collect, transfer and upload charge data (user ID, contract details, charge profile, charge report data etc.) between EVSE, car and other parties (EVSPs, clearinghouse etc.)</td></tr>
<tr><td>Failure outcomes</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td>Access not granted</td><td>No service is provided</td><td>• Incompatibility in hardware or communication</td></tr>
<tr><td></td><td>Charging is interrupted</td><td>Service delivery interrupted</td><td>• EVSE operator not responding
• DSO, EVSE operator or user intervenes
• Damaged connection, hardware or software</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">1406: ACT EVSE Backend
1407: ACT EVSP backend
133: ACT Vehicle Driver</td></tr>
<tr><td>Secondary actor</td><td colspan="3">129: ACT DSO Distribution system operator
132: ACT EVSE Operator
128: ACT EVSP (Electric Vehicle Service Provider)
140: ACT Clearinghouse</td></tr>
<tr><td>Main scenario</td><td colspan="3">• EV driver connects EV to EVSE and EVSE operator
• Charge plan constructed
• Charging managed according to charge plan
• EVSE operator monitors and distributes charge data to relevant actors
• EV driver disconnects EV from EVSE</td></tr>
<tr><td>Alternatives</td><td colspan="3">Mode 1 or 2 charging (By default we assume there is only Mode 3 charging).</td></tr>
<tr><td>Variations</td><td colspan="3">The Clearinghouse is involved only in case of roaming.</td></tr>
<tr><td>Related information</td><td colspan="3">-</td></tr>
<tr><td>Issues</td><td colspan="3">-</td></tr>
</table>

2.5.3.2 1502 UC EV Identification, Authentication and Authorization

This Use Case is listed before in this Chapter, please refer to paragraph 2.4.3.1

Scope & Level	Basic end-user services. This use case covers identification of contract belonging to a user (own customer or roamer) at a charge spot or battery switch station, and his authentication and authorization to execute the process of charging or battery switching). Use case describes the interaction between EV/ EV driver, EVSP, EVSE operator and optionally the Clearinghouse (when roaming).

2.6 Service performed after charging of EV

2.6.1 After Charging - Overview

Business services described in this chapter occur after the EV driver disconnects and physically leaves the parking space.

In the figure below the blue square area depicts the “During Charging” services and the black box includes all services that may occur after the charging is completed. There is expected some overlap with During Charging services, which depend on the implementation of the use cases in this chapter.

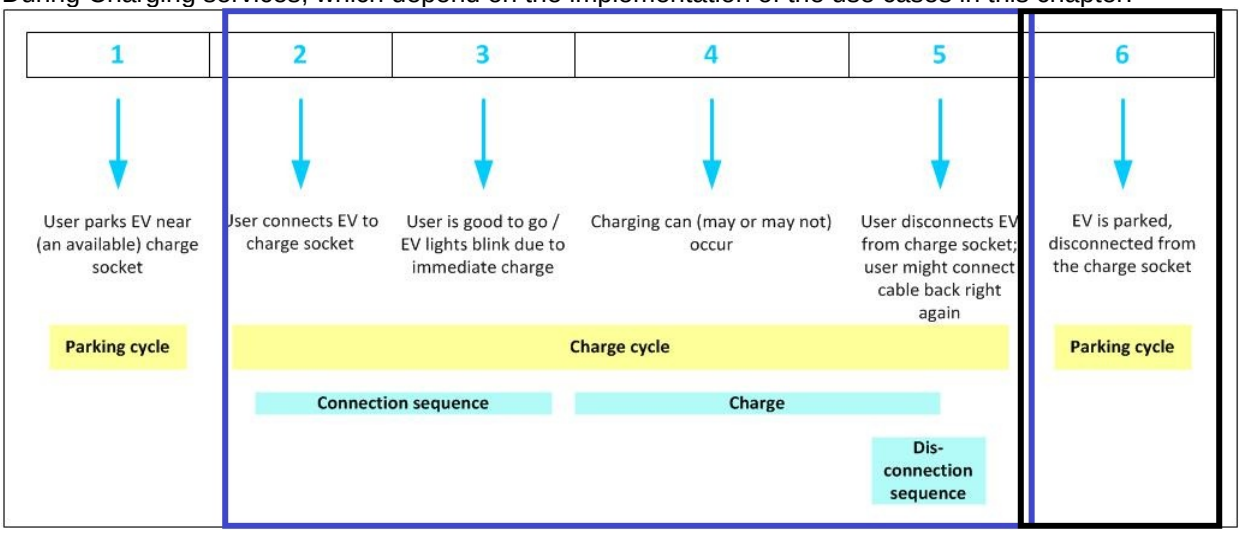


Figure 11Scope of "After Charging"

End user perspective

Basic end user services that take place after charging include charging history reports, billing, own EV account status overview, statistics of own EV use, etc.

Business to business perspective:

From the service provider's perspective, there are several value added services available to service requesters via a Marketplace. These include individual (per EV) or aggregated reporting on kilometers driven, energy consumed, CO2 emissions, etc.

Marketplace context:

In this stage, only a few After Charging Services have been identified and described. It is expected that more of these will be offered in the future by service providers directly or through Marketplaces. Currently these services satisfy Business scenarios from the Charging domains through feature 970 Consumption monitoring. The overarching use case of this section is defined as **1502** After charging.

The following table lists the Features that are relevant in the "Services after charging" phase (ref 2.1).

Features	Use Cases
970 FTR Consumption monitoring	1519UC After charging

Table 2.5 After Charging – Features and their Use Cases

2.6.2 After Charging - Feature Content

This feature comprises the following content:

970 FTR Consumption monitoring

This feature allows the driver to monitor different aspects of their EV consumption on either on-board device or through other channels (apps, internet etc.):

- Energy consumption
- Kilometer consumption
- Consumption of other services

2.6.3 After Charging - Use Case(s)

The details of this content are described in the following Use Case(s)

2.6.3.1 1519 UC After charging

Scope & Level	Basic end-user services. This use case covers all EVSP or marketplace routed services triggered by the action of unplugging the car from the charging (or completing the battery switch).
Goal in context	The primary goal of this use case is that the EVSE Operator documents charging data. Consequently, the EVSE operator distributes relevant information to the EV driver and third parties (receive charging report). By this use case, the user is enabled to use consumption monitoring services or "after-charging services" (view bills including kWh/km and roaming services consumed, CO2-footprint etc.) through a compatible interface with a service provider (telematics, app, website, email, phone call to customer services center or similar

	communication link		
Preconditions	• A service is requested either as a pre-setting or a specific request • The service requested can be provided to the user either directly from a service provider or through another service provider on the marketplace can access the user • The user can consume the service through a compatible communication link		
Successful out-come	The user is enabled to enabled to access and consume consumption monitoring services		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to out-come**
	Search failure	User is not able to identify a requested service	• Technical errors • Typing errors • Connectivity • Other
	Outdated or false information about consumption of services	The user is offered services based on incorrect or inac-curate information	• Service provider fails to update or track real-time information • User fails at making software updates • Other
Primary actor	133: ACT Vehicle Driver 1406: ACT EVSE Operator Backend 1407: ACT EVSP backend		
Secondary actors	140: ACT Clearinghouse 132: ACT EVSE Operator 128: ACT EVSP (Electric Vehicle Service Provider)		
Main scenario	User/driver monitors service consumption		
Alternatives	User has to keep track of consumption history in alternative ways		
Variations	-		
Related informa-tion	In certain cases CDR is sent from EVSE Operator to EVSP via the Clearinghouse.		
Issues	-		

3 Driving and cross domain use case model

3.1 Overview

The use cases in this sub-chapter are mostly described by Siemens and realize basic end user services. These services relate to the use of the electric vehicle and driving during all three charging cycles as described above. The character of these services however, is beyond the basic use of EV, they include the planning in connection to other means of transport (intermodality), vehicle tracking, parking management (without charging), battery life information, etc.

Some of these services are overlapping with other domains, for example use case ID 1524 describes the monitoring of EVSE by fleet manager and there is a use case in the energy domain ID 1598 which describes the monitoring of aggregated EVSE use under a substation. Although these use cases are similar in their goal and scope, they serve different purposes and have different main actors.

Driving services satisfy Business scenarios from the Charging and OEM domains mainly through the Features 1298 Parking space management and monitoring, 1318 Reservation of charging point, 944 Vehicle tracking and FTR 920 Battery life.

The three Cross domain services stand aside from the usual structure because of their complexity. By their scope these features are almost on the level of a scenario, there are several variations and multiple actors, which act through the use cases.

These Features are:

- Intermodality planning: considers planning and optimized search for a trip using several means and combinations of transportation (e.g. EV and train)
- Fleet management: overview and management of EV fleet, including analysis and real-time monitoring
- CO2 intensity: reporting of CO2 on aggregated levels

3.2 Actors

The following table lists the identified Actors in the Driving and Cross domain Services

ID	Actor	Description
129	ACT DSO Distribution system operator	Provides the power connection point to the charging spot.
1595	ACT Emergency Service Center	Emergency Service Center
143	ACT EV (Electric Vehicle)	Provides access to the vehicle data
131	ACT EVSE (Electric Vehicle Supply Equipment)	is used to exchange energy between the EV and the Grid
1406	ACT EVSE Backend	Backend, administrative systems of the EVSE Operator, as opposed to frontend, on-site systems that communicate directly with EV's
132	ACT EVSE Operator	in charge of managing the EVSEs
128	ACT EVSP (Electric Vehicle Service Provider)	offers e-mobility services to the end customers

ID	Actor	Description
1594	ACT Fleet manager	Organization that manages a fleet of EV's
136	ACT Marketplace Operator	Operates the platform and communications, and manages access to and working of the marketplace
134	ACT OEM	Manufacturers of electric vehicles and charging equipment
135	ACT Public Sector	EU commission, National government, local government, municipalities
137	ACT Service Provider	Business Partner that offers and sells EV Services on the marketplace
1579	ACT Third Party Service Provider	An actor which provides access to third party data
133	ACT Vehicle Driver	Human, currently driving the Vehicle

Table 3.6 Driving and Cross Domain Services - Actors

Several interactions between these actors as are illustrated in 1200 BPD Enhanced charging, please refer to Appendix B.

3.3 Driving Features and Use cases

The following table lists the Driving services. To improve readability, the Driving Features have been grouped into three categories. Note that the for the three “Driving” groups, most Use Cases support most Features (many-to-many).

Group	Features	Use Cases
Battery Life Services	920 FTR Battery life 1278 FTR EVSE Charging capabilities	1558 UC Update Charging Details 1561 UC Calculate CO2 Emission 1562 UC Report Electricity Consumption
Vehicle Tracking Services	945 FTR Notification 944 FTR Vehicle tracking	1564 UC Show Current EV Position 1567 UC Call For Roadside Assistance 1568 UC Show EV Position History 1575 UC Crash Notification 1569 UC Transmit Notification 1576 UC Set Geofence
Charging Infrastructure Management Services	1309 FTR Charging location Mgmt 1298 FTR Parking space monitoring 1297 FTR Parking space management	1529 UC Charging Location Mgmt 1563 UC Parking Space Monitoring 1574 UC Third Party Information 1557 UC Parking Space Management

Table 3.7 Driving services - Features and their Use Cases

3.3.1 Battery life services – Feature content

This feature group comprises the following content:

920 FTR Battery life

This feature comprises use cases related to the reporting on the battery use.

1278 FTR EVSE Charging capabilities

This feature comprises information of an EVSE's charging capabilities in order to display only compatible EVSE options to the driver.

The information should reflect the EVSE's charging capabilities:

- AC charging
- DC charging
- Battery swapping

Tasks in the feature:

- Define a format for infrastructure capabilities
- Define APIs to retrieve infrastructure capabilities

3.3.2 Battery life services – Use cases

3.3.2.1 1558 UC Update Charging Details

Scope & Level	Value added service. Transmission of charging information.		
Goal in context	The detailed charging information is transferred to the market place database.		
Preconditions	The EV is connected to the supply equipment and ready to transfer the collected data. The EVSE is connected to a network and the central marketplace.		
Successful outcome	The detailed charging data is submitted to the marketplace.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	The transfer of data is interrupted	Cancellation of the data upload.	Network connection problem. Lost connection to the central database.
	The collected data is inconsistent / contains errors.	The uploaded data is marked as invalid and will be removed if requested.	Defective sensor readings Transmission problems.
	No connection to vehicle	• Display of a warning message. • No charging data will be transferred.	The requested EV is not connected to an EVSE.
Primary actor	132: ACT EVSE Operator		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 1579: ACT Third Party Service Provider 143: ACT EV (Electric Vehicle) 134: ACT OEM		
Main scenario	The data upload is initiated with the beginning of the charging process. The charging data • SoC - state of charge/time[%] • voltage/time[V] • total capacity[%] • temperature/time (optional) • humidity/time (optional) • number of current charging cycle • type of charge (fast/slow) • charge-current/time[A] plus the local timestamp, mileage and position is packed and submitted to the marketplace. Reports based on this data are provided.		

	For more information please refer to Figure 28 Update Charging Details in the Appendix
Alternatives	-
Variations	It is also possible to start the data transfer by request of the marketplace if the EVSE has acknowledged the connection of the requested EV.
Related information	The sensor data of the charging device and the supply equipment will be used for reporting purposes and for optimization of charging cycles and electric energy distribution. The collection of charging data is therefore an important information source for current and scheduled energy flow for the energy supplier and the (third party) service provider. This detailed information of the charging process is an extension of the standard Charging Data Records (CDR) and has to be handled with great accuracy by making it anonymous and encrypted. The attendees of the marketplace have to calculate the pros and cons of this service, but the potential benefit of detailed reporting data is a major argument. For an illustration of this Use case please refer to Figure 28 Update Charging Details in Appendix C.
Issues	-

3.3.2.2 1561 UC Calculate CO2 Emission

Scope & Level	Value added service. The CO2 emission of an energy supplier can be calculated.		
Goal in context	Calculate a list of CO2 indexes of an EV for a requested period of time.		
Preconditions	An EV is registered at the marketplace (resp. the driver is authenticated). Charging data records (CDR) or battery life data have been synchronized through the marketplace before.		
Successful outcome	A calculated list of CO2 indexes of a requested EV for every energy retailer that was involved in charging processes in the specified period of time is generated.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	The CO2 index can't be calculated.	• Display of an error message • Cancellation of the index calculation.	The requested EV is unknown. There is no data for the given EV and time period The specified period of time is invalid.
Primary actor	137: ACT Service Provider		
Secondary actors	130: ACT Energy Retailer 143: ACT EV (Electric Vehicle) 133: ACT Vehicle Driver 132: ACT EVSE Operator 138: ACT Service Requester 128: ACT EVSP (Electric Vehicle Service Provider)		
Main scenario	The CO2 index per energy supplier based on the unified CO2 intensity/kWh (energy mix) is being calculated for an EV and for a specified period of time.		

Alternatives	-
Variations	In some implementations this functionality will be a rather simplified model. Betterplace may implement such a simplified model in Denmark, calculation CO2-emissions from [average share of renewable energy in the grid over a period of time] and [average driver behavior]. This will not be the accurate CO2 emission of a particular EV driver.
Related information	Charging data records (or at least a subset of these) have to be transferred through the marketplace to the Charging Service Provider to enable this service. It has to be clarified if the benefit for the attendees of the marketplace is bigger than the possible risk of publishing business data. All business relevant information has to be made anonymous. Only the calculated indexes are exported to an authorized requester.
Issues	-

3.3.2.3 1562 UC Report Electricity Consumption

Scope & Level	Value added service.Show the electricity consumption of a vehicle. This use case enables EVSE operator to report an EVSP of current and historical charging service consumed (e.g. electricity consumption) by a given EV driver		
Goal in context	The charging service of a requested vehicle is reported with a CDR and made available to the EVSP through the Marketplace or transferred directly from the EVSE operator.		
Preconditions	The EVSE operator can read the consumption of the EV at a particular EVSE The EVSE operator can communicate energy consumption to the EVSP either directly or through a clearinghouse		
Successful outcome	The service consumption of a vehicle for a given period of time is reported to the EVSP		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	The requested vehicle is unknown.	• Display of an error message • Cancellation of the report generation.	The requested EV ID has not been registered.
	The vehicle has not transferred any data for the requested period of time.	• Display of an error message • Cancellation of the report generation.	The EV has not synchronized any battery and charging data for the requested period of time.
	No charging location available.	• Display of a warning message • Limited report generation.	The EV has not synchronized any charging data with a compatible EVSE. The location of the EVSE is not registered.
Primary actor	132: ACT EVSE Operator		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 1579: ACT Third Party Service Provider 133: ACT Vehicle Driver		
Main scenario	An EVSE operator provides several reports to show the current and past consumption of charging service of an EV. The data, that is collected while charging and at the end of charging and transferred to the EVSP of the EV driver either directly or through a clearinghouse		
Alternatives	-		

Variations	Other output formats (like Excel or PDF documents should be provided, too). The consumption of electricity may also be evaluated if the vehicle has been charged at a home EVSE / car port. Charging services can be bought and sold in a number of variations. Reporting consumption in kWh is just one model, another could be parking/connection time, a third could be "one fee". This completely depends of the business model adopted by business partners.
Related information	-
Issues	Is the usage of a home smart meter provided?

3.3.3 Vehicle tracking – Feature content

This feature group comprises the following content:

945 FTR Notification

Use cases in this feature will notify through the marketplace in case of one of the following events:

- Theft Alert Notification
- Roadside Assistance

944 FTR Vehicle tracking

This feature will comprise information from the vehicle tracking. The use cases will utilize the tracking data in following:

- Automatic Crash Notification
- Manual Crash Notification
- Vehicle Tracking
- Geo-fencing
- Speed Alert

3.3.4 Vehicle tracking – Use cases

3.3.4.1 1564 UC Show Current EV Position

Scope & Level	Basic end user service. Transmit the current position of an EV (tracking).		
Goal in context	The last / current position of an EV is evaluated and displayed.		
Preconditions	The requested EV has an onboard unit that uses an online connection (GPRS, UMTS, ...) to permanently send GPS positions to the Routing/Location Service Provider. The current position of the EV is stored to a database and ready to read.		
Successful outcome	The current position of the EV is displayed in form of coordinate values or in a geographical map. This information is made available to/through the Marketplace.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No current EV position.	• Display of a warning message • The EV is marked as “wrongly located” at the last known position.	The onboard unit of the EV had no network connection. The GPS device of the vehicle had no contact to satellites.

	Invalid position.	• Display of a warning message • The EV is located at the last valid position.	The GPS receiver calculated an abnormal (impossible) new position of the EV.
	No service available	• The current position is stored to the onboard unit internal storage and will be sent again when the connection to the central service reestablishes	Temporary loss of mobile network connection. The central service is temporary offline.
Primary actor	143: ACT EV (Electric Vehicle) (on-board equipment) 137: ACT Service Provider		
Secondary actors	1579: ACT Third Party Service Provider (Routing/Location Service Provider) 128: ACT EVSP (Electric Vehicle Service Provider)		
Main scenario	• The onboard unit of the vehicle permanently calculates the current position • The position is sent in configurable intervals to the marketplace and the location service database. • In case of special events (emergency, geofence incidents, car crash, ...) additional positions will be sent immediately. • The history of position data is used for several reports and additional services (e.g. routing).		
Alternatives	-		
Variations	-		
Related information	The interval between position data transmissions is configurable in a central configuration service of the EVSP. The transmission interval is synchronized with the onboard unit configuration. The main collector of position data will be a Location Service Provider. But the current position will also be available as a basic service of the marketplace to enable further services. Please refer to Figure 24 Get Current Position and Figure 25 Send Current Position in the Appendix for more information		
Issues	Privacy		

3.3.4.2 1567 UC Call for Roadside Assistance

Scope & Level	Basic end user service. The driver is actively asking for roadside assistance.		
Goal in context	Initiate call for roadside assistance from an EV or a mobile device through an EVSP directly or through a Marketplace.		
Preconditions	The EV can use a mobile connection to connect the marketplace. The user of the EV is activating the assistance request.		
Successful outcome	The roadside assistance request is sent to the Marketplace, forwarded to an Assistance Service and acknowledged.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No mobile network connection available	• Display of an error message • The request is stored and will be sent when the connection is established.	There is temporarily no active mobile network connection. The sending device is damaged.

	The transmission of the request is interrupted.	• Display of an error message. • The request is stored and will be sent again after a defined period of time until it succeeds or a maximum number of retries is exceeded.	The mobile network connection is interrupted.
	The request is not acknowledged	• Display of an error message. • The request is stored and will be sent again after a defined period of time	The marketplace or the Assistance Service is temporarily not available.
Primary actor	143: ACT EV 133: ACT Vehicle Driver		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 137: ACT Service Provider (on the marketplace) 1579: ACT Third Party Service Provider (Roadside Assistance Service Center)		
Main scenario	• The driver initiates the roadside assistance request. • The request is received by the marketplace and forwarded to a Roadside Assistance service center • The assistance request is acknowledged (through the marketplace). Please refer to Figure 23 Call for Roadside Assistance in the Appendix for more information		
Alternatives	-		
Variations	-		
Related information	The request and the current position of the vehicle aretransmitted to a Roadside Assistance Service Center through the marketplace. A voice call can be initiated to ask for the current situation if a mobile phone number was transmitted, too.		
Issues	-		

3.3.4.3 1568 UC Show EV Position History

Scope & Level	Basic end user service. Display a history of vehicle positions.		
Goal in context	The list of positions of an EV is displayed (in a map).		
Preconditions	The EV is registered to the system and has transferred position data before. The period of time for the location history is defined.		
Successful outcome	A track of vehicle positions in a fitting map is displayed.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	unknown EV	• Display of a warning message	The EV's id is not registered to the central service.
	No data for the period of time of this EV	• Display of a warning message.	The EV has not sent any location information for the requested period of time.
Primary actor	137: ACT Service Provider (on the Marketplace) 1579: ACT Third Party Service Provider (Location Service Provider)		

Secondary actors	1594: ACT Fleetmanager 128: ACT EVSP (Electric Vehicle Service Provider)
Main scenario	• An authorized user of the marketplace is asking for the position of an EV • A valid period of time for the position history is defined • The request is forwarded to the location service provider that has stored the location history of this vehicle. • The list of vehicle positions can be displayed in a map.
Alternatives	-
Variations	-
Related information	The service uses data previously stored to the database of the location service provider and is not requesting the EV for a current position.
Issues	Privacy of end user data (possibly regulated by local legislation)

3.3.4.4 1575 UC Crash Notification

Scope & Level	Basic end user service. Send an (automatic) crash notification to the marketplace.		
Goal in context	Automatic or manual notification of a crash.		
Preconditions	The EV can use a mobile connection to the central service. The crash incident is identified by the car sensors automatically.		
Successful outcome	The crash notification is sent and acknowledged. The information is forwarded to an emergency service center.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No mobile network connection available	• Display of an error message • The notification is stored.	There is temporarily no active mobile network connection. The sending device is damaged.
	The transmission of the notification is interrupted.	• Display of an error message • The notification is stored and will be sent again when the connection is reestablished	The mobile network connection is interrupted.
	The request is not acknowledged	• Display of an error message • The request is stored and will be sent again after a defined period of time	The central service is temporarily not available.
Primary actor	143: ACT EV		
Secondary actors	137: ACT Service Provider (on the marketplace) 1595: ACT Emergency Service Center 128: ACT EVSP (Electric Vehicle Service Provider) 133: ACT Vehicle Driver		
Main scenario	• A crash situation is identified by vehicle sensors • A high priority notification is sent to the market place (this includes the current position of the vehicle) • The market place forwards the information (this includes a phone number) to an emergency service center		

	• The emergency service center contacts the driver if possible to get more information about the current situation • The emergency service center initiates the rescue based on all collected information.
Alternatives	-
Variations	The driver may activate the crash notification by himself.
Related information	An emergency service center is contacted automatically. They can initiate a call-back to investigate the emergency situation. This critical service is always supported by a third party service provider. *For illustration of this use case please refer to Figure 27 Send Notification V2M and Figure 26 Send Notification M2V in Appendix C.*
Issues	-

3.3.4.5 1569 UC Transmit Notification

Scope & Level	Basic end user service. Scenario O2c. Send a notification between the marketplace and the EV.		
Goal in context	A notification is sent from the marketplace to the onboard unit of the requested EV or the other way round. The message is transmitted to the driver of the vehicle if recommended and can be acknowledged. Notifications to the marketplace are acknowledged automatically.		
Preconditions	The onboard unit of the EV is connected to a mobile network with internet connection.		
Successful outcome	The notification is received by the onboard unit of the target vehicle or the marketplace and acknowledged if recommended.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No response from EV	• Storage (and display) of a warning message. • The notification is sent again when an "alive" signal from the EV is received.	The EV is temporarily not connected to a network.
	Missing acknowledge (from EV)	• Storage (and display) of a warning message when the response time exceeded.	The driver cannot reply to the notification due to traffic conditions or temporary loss of network connection.
	Missing acknowledge (from Marketplace)	• Some specific notification require an acknowledge. In these cases a warning message will be displayed. • The notification is repeated until the acknowledge is received.	The service is temporarily offline.
Primary actor	137: ACT Service Provider (Marketplace)		

Secondary actors	143: ACT EV (Electric Vehicle) - on board unit 134: ACT OEM - on board unit 133: ACT Vehicle Driver 1579: ACT Third Party Service Provider 128: ACT EVSP (Electric Vehicle Service Provider)
Main scenario	• The message is displayed to the driver of the vehicle if recommended (Market-to-Vehicle). • Special types of notification have to be acknowledged. • The driver can only confirm the notification when he stops or interrupts the trip. • The onboard unit can confirm special types of notification automatically. • The marketplace acknowledges automatically. *For more information please refer to* Figure 26 Send Notification M2V *in the Appendix*
Alternatives	-
Variations	-
Related information	The attention of the driver is never affected. The driver must not acknowledge while driving. For illustration of this use case please refer to Figure 26 Send Notification M2V and Figure 27 Send Notification V2M in Appendix C
Issues	-

3.3.4.6 1576 UC Set Geofence

Scope & Level	Basic end user service. Set a geofence for a specific EV.		
Goal in context	Set the geofence for an EV.		
Preconditions	The onboard unit of the EV is connected to a mobile network. The limited number of active geofences for an EV has not exceeded. The specified EV is always connected to a mobile network (see variations).		
Successful outcome	The geofence information for an EV is stored through the marketplace to a database of the location service provider.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	vehicle unknown	• Display of a warning messages • No geofence information is stored	The requested vehicle is not registered
	Number of geofences exceeded	• Display of a warning message • The last geofence is not stored	The configurable maximum number of geofences is exceeded
Primary actor	137: ACT Service Provider 1579: ACT Third Party Service Provider - Location Service Provider		
Secondary actors	133: ACT Vehicle Driver 1594: ACT Fleetmanager 128: EVSP (Electric Vehicle Service Provider) 1579: ACT Third Party Service Provider - Routing Service Provider		

Main scenario	• Set a geofence for a specified (list of) EV • This information is used to initiate automatic geofence notifications by the Location Service Provider o predefined notifications (for the driver) if the vehicle enters or leaves a specified area o warnings (for the EVSP) if a vehicle leaves a parking position (theft alert)
Alternatives	-
Variations	A limited number of geofences could be sent to the vehicle directly to enable local warning messages if the vehicle has no continuous mobile network connection. This service could be combined with routing services.
Related information	It is possible to offer this functionality as an additional service to the user of the car. The driver may want to be notified if he enters or leaves a user defined area.
Issues	-

3.3.5 Charging infrastructure management – Feature content

This feature group comprises the following content:

1309 FTR Charging location management

A charging location is a site with charging points usually run by EVSE Operators.
Every charging location needs a management component that enables site-monitoring, controlling and communication with the marketplace. This component also makes customer authentication requests to the clearinghouse.

1298 FTR Parking space monitoring

This feature allows the monitoring of parking space usage data for requesting parties like EVSP or public authorities.

1297 FTR Parking space management

This feature deals with the usage of charging points as parking space only.

3.3.6 Charging infrastructure management – Use cases

3.3.6.1 1529 UC Charging Location Management

Scope & Level	Basic end user service. The Management of Charging Infrastructure (e.g. Charge point (EVSE)) Basis for the use case is that the Charging spot master data (e.g. CP-ID, address, technical data) are registered within the Charging Location Management... The EVSE Op. will monitor the charging session with the following functionality: • actual status (e.g. free, charging, maintenance) of the EVSE • actual consumption of the EVSE / Session • actual status of charging spot environment (e.g. FI- / LS-switch, panel) • Alarms from the Charging Spot

	The EVSE Op. will control the charging spots with the following functionality: • Reboot of Charging Spot • Switching (e.g. FI / LS) • Start- / End of Charging Session • SW-Update (per remote connection) Configuration management / monitoring can be done by a context menu (tree, map and list). The Charging Location Management application need interfaces to the following applications to support the authentication of e-vehicle end-user and search / reservation of Charging spots (EVSE): • EVSE (bidirectional) • Clearinghouse (bidirectional) • e-Vehicle end-user customer portal For the reporting of the Charging Sessions, the EVSE operator can analyze the actual and historical data within the Charging Location Management application.		
Goal in context	A charging location is a site with charging points usually run by EVSE Operators. Every charging location needs a management component that enables site-monitoring, controlling and communication with the marketplace. This component also makes customer authentication requests to the clearinghouse. The goal of Charging Location Management use case is to control and monitor charge sessions / processes, as well as to transfer values and status messages from the CP (EVSE) to third parties.		
Preconditions	• master data of Charging Spots • Interface to Charging Spots		
Successful outcome	Monitoring and controlling of Charging spots		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	No connection to CP	Remote monitoring and control of CP via Charging Location Management application not possible	• Damaged hardware • Interrupted connection • Incompatible software version
Primary actor	131: ACT EVSE (Electric Vehicle Supply Equipment)		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 129: ACT DSO Distribution system operator 133: ACT Vehicle Driver		
Main scenario	• Registration of Charging Point (infrastructure) • Search and Monitoring of Charging Point (infrastructure) • Change, update, adjustment of Charging Point (infrastructure)		
Alternatives	-		
Variations	-		
Related information	• Requires a high availability of system (e.g. > 98%) • Requiresa high systems performance / and fast response time • Requires a secure and stable system environment		
Issues	-		

3.3.6.2 1563 UC Parking Space Monitoring

Scope & Level	Value added service. Parking space monitoring The service requester will be enabled to monitor the:

	• usage of CPs (number of CPs connected to any EV) • usage of parking spaces (CPs physically occupied by vehicles, but not charging)		
Goal in context	A service requester uses the Parking Space Monitoring service to monitor the usage of the parking spaces at charge points (EVSEs).		
Preconditions	• The EVSE backend is connected to the market place • The EVSE backend provides a Parking Space Monitoring service • The EVSE is equipped with sensors to detect, if any car blocks the parking space		
Successful outcome	The real time usage data of the parking spaces within the Charge point (EVSE) will be provided to the EVSE operator to support the charging location management. The aggregated usage reports can be provided via the market place to demanding parties. Analysis of the these reports may help EVSP or municipalities to adapt parking tariffs and to plan the spatial distribution of further parking spaces		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	No monitoring	No parking space monitoring data will be provided	Parking Space Monitoring service of EVSP is not working properly.
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider) requests current usage data 135: ACT Public sector requests aggregated history data		
Secondary actors	1406: ACT EVSE Operator Backend 131: ACT EVSE (Electric Vehicle Supply Equipment)		
Main scenario	• EVSP requests data about current usage of CPs within a selected Charge point (EVSE) • The Parking Space Monitoring service returns detailed records		
Alternatives	• Public sector requests history data about EVSE usage for selected EVSE and time frame • The Parking Space Monitoring service returns aggregated records of the selected time frame		
Variations			
Related information			
Issues			

3.3.6.3 1557 UC Parking Space Management

Scope & Level	Value added service. Parking space management. An EV driver needs a parking space only. Therefore the EV driver shall be able to use a CP as parking lot without charging the EV. This use case extends the use case UC Charging Location Management (1529).
Goal in context	The EV is allowed by the EVSE backend to park at desired/selected parking spaces, regardless of its need to charge.
Preconditions	• The EVSE Op. backend is connected to the market place • The EV driver needs to have a (roaming) contract with a EVSP • The EVSE Op. needs to have a contract with the EVSP • The EVSE Op. is able to detect, if the CP is blocked by any car • The EVSE is equipped with a HMI to allow request of the "Parking only" mode and to signalize the response (e.g. by red/green lights)

	• The parking lot must be owned by the EVSE Operator		
Successful outcome	The HMI signalizes, that the EV driver is allowed to use the selected CP for "Parking only" by the EVSE backend. The EV driver will be billed for parking for the whole parking time (independent from charging) via his EVSP.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Only Parking not allowed	The mode "Parking only" for the selected CP is not allowed (red light)	The CP is proposed for charging only (currently).
	EV driver is not allowed to use CP	Usage of CP is not allowed (red light)	• EV driver is not authorized to use a CP of this EVSE • The CP is reserved for another EV driver
Primary actor	133: ACT Vehicle Driver		
Secondary actors	1406: ACT EVSE Operator Backend 128: ACT EVSP (Electric Vehicle Service Provider)		
Main scenario	• The EV driver authenticates at the EVSE via the HMI of the CP • EV driver selects the "Parking only" mode • EV driver waits, until the HMI signalizes the permission to use the "Park only" mode for the occupied CP • EV driver stops the parking session by using the HMI of the CP, before leaving the CP with the EV • EV driver will be billed for "Parking only" by his EVSP		
Alternatives	• EV driver forgets to check out at the CP before leaving the CP with the EV. In this case the EVSE Operator stops billing when the system detects that the CP is not blocked any longer.		
Variations	The EV driver will be billed for parking, but only for the time where no charging takes place (may cause problems, if EV needs only trickle charging).		
Related information	• This use case refers to CPs, where besides charging also a great demand for (short time) parking exists. This will happen mainly in central areas. • In areas where CPs are scarce in relation to the number of EV's, only few CPs will be equipped to allow "Parking only". • The allowed parking time should be quite short to prevent longer blocking of the CPs for parking reason. • It will not be possible to reserve a CP for "Parking only". • The response time to the "Park only" request should not exceed a few seconds, because it would be unacceptable for the EV driver to wait longer.		
Issues	The detection of misuse: • a car uses the CP without authentication of the driver at the Charge point (EVSE) • A non electric car uses the CP (or shall it be allowed to use the CP with a non electric car by using a (much) higher parking tariff?). Currently there exist no legal rules which allow the reservation of a parking space for EV-s only.		

3.4 Cross domain Features and Use cases

This group contains the following Features and Use Cases.

Note that for the Cross Domain Features, each Feature comprises a number of distinct Use Cases (one-to-many), but there are a few fundamental Use Cases such as “Access Car Information” that support multiple Features (many-to-few).

Feature	Use Cases
1300 FTR Car information	1548 UC Access Car Information
1303 FTR Intermodality planning	1520 UC Users can book pool-cars online 1525 UC User wants travel and has specific requirements 1548 UC Access Car Information
1301 FTR Fleet management	1522 UC Assign car to scenario 1520 UC Users can book pool-cars online 1521 UC Status for cars can be maintained by Fleet Manager 1523 UC Fleet manager tracks pool-car 1524 UC Fleet manager monitors energy consumption of pool-cars
1320 FTRCO2 intensity	1592 UCCO2 Reporting

Table 3.8Cross Domain Services - Features and their Use Cases

3.4.1 1300 FTR Car information

In order to enable scenarios like intermodal planning and fleet management it is important to have additional car information available, such as general and detailed information in the categories current status, technical/ performance data, usability (payload and space) and offered equipment/ infotainment

Current status
- actual state of charge
- remaining range
- connection to EVSE and possible options (e.g. pre-condition heating or air-conditioning possible and offered as additional services)
- winter/ summer tires mounted

Technical and performance data
- range (eventually with a minimum/ average/ maximum band according to driving and temperature conditions)
- charging time and capabilities (AC (1,2 or 3 phase or DC with power levels, battery switching, support of ISO15118 with individual contract certificate upload as additional service offered)
- maximum battery capacity
- 2WD or 4WD
- acceleration and top speed
- information on range extender (yes/ no)

Usability
- number of seats, information on flexibility (e.g. 3rd row can be flatten in trunk)
- number of doors
- volume of trunk
- maximum payload

- safety systems, Isofix system for child's safety seat (yes/ no)
- possibility of roof box to be mounted (yes/ no) and eventually to be order as additional service

Equipment/ Infotainment
- Air conditioning, electric seat adjustment, seat heating, etc.
- navigation system
- internet access/ connectivity
- audio system and connections (e.g. USB, connection for smart phones)

This feature also comprises information of a car's charging capabilities in order to locate only compatible EVSE options to the driver.

3.4.1.1 1548 UC Access Car Information

Scope & Level	Value Added Service. Users should get access to car information items		
Goal in context	Users should get access to car information items (e.g. state of charge, est. range, etc.). Fleet users, e.g. in “innovative car on demand pools”, may have different requirements regarding space and trunk capacity or range for single trips. Hence a vehicle reservation out of such a fleet should allow a search based on these criteria.		
Preconditions	OEMs provide access to car information.		
Successful outcome	User gets car information.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	No access to car information.	No information is shown to the user (user can also be a system). Additional services that rely on this feature may be affected.	• Network issues • Backend issues • Car issues • Infrastructure issues
Primary actor	133: ACT Vehicle Driver 137: ACT Service Provider 136: ACT Marketplace Operator 1594: ACT Fleetmanager		
Secondary actors	134: ACT OEM		
Main scenario	Increase convenience for fleet user		
Alternatives	Direct lookup in the car itself. Estimation based on underlying conditions.		
Variations			
Related information			
Issues			

3.4.2 1303 FTR Intermodality planning

Planning of travels that include different means of transportation (e.g., EV, Bus, Train, Taxi, Plane, Bike). This component should enable to determine the best transportation combinations based on the user's travel request and his preferences.

Examples for user preferences:

- travel duration
- CO2 emissions
- travel distance
- costs
- comfort

3.4.2.1 1520 UC Users can book pool-cars online

Scope & Level	Value Added Service		
Goal in context	User wants to have a pool-car in a specific time frame for a specific trip		
Preconditions	Pool cars available, booking homepage is available, Fleet Manager is in place, Cars communicate at least their Status of charge and the vehicle identification number.		
Successful outcome	A sufficiently charged car is available and reserved for the user.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	no car available	no car is reserved, request remains in a queue	no car is available, which is sufficient for the request of the user
	no charge point available	no car is reserved, request remains in a queue	the car has to recharge at least once during the trip and no charge point is available
Primary actor	133: ACT Vehicle Driver		
Secondary actors	1594: ACT Fleetmanager		
Main scenario	user logs into the system, user enters his request parameters, system finds appropriate car and informs user about reservation		
Alternatives	the fleet manager can try to find an appropriate car manually		
Variations			
Related information			
Issues			

3.4.2.2 1525 UC User wants to travel and has specific requirements

Scope & Level	Value Added Service		
Goal in context	User wants to travel from A to B, using the fastest, cheapest, most efficient means of transport. He can book his planned travel online.		
Preconditions	• Marketplace is operational • Carpooling is available • User has a contract with mobility provider • Other means of transportation are available as well as their systems. • System checks for the best connection, considering all means of transport • System offers the user a multimodal connection (using a pool-e-car to the train station in A, taking train to station in B, take an e-bike to the final destination in B).		
Successful outcome	User has the ability to alter the system-proposal and finally book the travel. The system will then reserve e-car/ e-bikes/ seats (train) and charge the user´s credit card		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to**

			outcome
	other mobility system is not available	travel may be not optimal, but still a valid travel is calculated	other mobility system is not available
Primary actor	133: ACT Vehicle Driver 137: ACT Service Provider(Mobility Provider)		
Secondary actors	1579: ACT Third Party Service Provider		
Main scenario	user enters his request into the system, systems searches for possibilities to fulfill the request and informs the user		
Alternatives			
Variations			
Related information	Luggage may constrain the mode of travel		
Issues	The whole approach is depending on availability of many external systems		

3.4.2.3 1548 UC Access Car Information

This Use Case is listed before in this Chapter, please refer to paragraph3.4.2.3

Scope & Level	Value Added Service. Users should get access to car information items.

3.4.3 1301 FTR Fleet management

The fleet management feature is a superset of different features which should support a fleet manager in fulfilling his daily work.
Basic features can be:

- managing EVs
- managing sites and charge points
- car bookings
- managing user authorizations
- charge point reservations
- billing
- statistics & reporting
- car information
- vehicle tracking aka car location
- car maintenance

3.4.3.1 1522 UC Assign car to scenario

Scope & Level	Value Added Service. Cars can be assigned to various scenarios.
Goal in context	Cars can be assigned to various scenarios which affect availability of the car: a scenario can, for example, be “executive use only” which restricts booking to executives only or “maintenance” which would indicate that the car is being maintained or in need of maintenance and cannot be booked at all
Preconditions	Pool cars available, system is available, Fleet Manager is in place, Cars communicate at least their Status of charge and the vehicle identification number.
Successful outcome	Availability of the pool-car is restricted to certain groups only. The Fleet Mgr. can improve availability for certain groups of users by assigning cars to scenarios.

Failure outcomes	Failure	Outcome	Condition leading to outcome
	Car can't be assigned to a scenario.	No scenario based car treatments are possible.	• Feature not available • Backend problems • Connection problems
Primary actor	1594: ACT Fleetmanager		
Secondary actors			
Main scenario	fleet manager opens the edit mode of a car in the fleet management system, fleet manager changes the scenario from one to another and saves the changes		
Alternatives	No scenarios available => all cars are handled the same way		
Variations			
Related information			
Issues			

3.4.3.2 1520 UC Users can book pool-cars online

This Use Case is listed before in this Chapter, please refer to paragraph 3.4.2.1

Scope & Level	Value Added Service

3.4.3.3 1521 UC Status for cars can be maintained by Fleet Manager

Scope & Level	Value Added Service. The fleet manager wants to maintain the status of a car		
Goal in context	Status for cars can be maintained by Fleet Manager: the Fleet Mgr. can set status information for each car to track damages, failures, need for repair/ maintenance as well as work that has been done so far (parts replaced, maintenance- and service-work). The System notifies the Fleet Mgr. when service works are necessary.		
Preconditions	Pool cars available, system is available, Fleet Manager is in place, Cars communicate at least their Status of charge and the vehicle identification number.		
Successful outcome	The status of a car is changed (damage, failure, need for repair/maintenance, changes are noted in the system). The fleet manager knows exactly in which state the cars are, what has been done so far and what needs to be done anytime soon.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Status cannot be set.	No car history creation possible. Cars that are not ready for usage are still considered for planning => service errors.	• Connectivity issues • Backend issues
Primary actor	1594: ACT Fleetmanager		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) as “Fleet Provider” 132: ACT EVSE Operator		
Main scenario	fleet manager enters the edit mode of a car, user changes the status of a car i.e., to "in maintenance", user saves car data		

Alternatives	Deletion of cars from system + manual logbook.
Variations	Status is set by the driver in the car directly.
Related information	
Issues	

3.4.3.4 1523 UC Fleet manager tracks pool-car

Scope & Level	Value Added Service. Tracking of cars		
Goal in context	Tracking of cars: the system submits the whereabouts of each car, either by GPS/GSM or when plugged to EVSE (identification through Vehicle Identification Number/ location through EVSE location). The Fleet Mgr. is able to track the cars down.		
Preconditions	Pool cars available, system is available, Fleet Manager is in place, Cars communicate at least their Status of charge and the vehicle identification number.		
Successful outcome	Fleet Mgr. knows where the cars are located and is able to allocate them efficiently.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Tracking not possible	Car location cannot be tracked. Additional Services such as planning algorithms may be affected.	• Backend issues • Network issues • Car issues • Weather issues • Location issues
Primary actor	1594: ACT Fleetmanager		
Secondary actors	132: ACT EVSE Operator 128: ACT EVSP (Electric Vehicle Service Provider) as “Fleet Provider”		
Main scenario	fleet manager enters the tracking menu of the fleet management system, fleet manager looks at the current position of one or multiple cars		
Alternatives			
Variations			
Related information			
Issues			

3.4.3.5 1524 UC Fleet manager monitors energy consumption of pool-cars

Scope & Level	Value Added Service. Monitoring of energy consumption for single cars or the whole fleet.
Goal in context	Monitoring of energy consumption.
Preconditions	Pool cars available, system is available, Fleet Manager is in place, Cars communicate at least their Status of charge and the vehicle identification number.

Successful outcome	Energy-consumption can be seen either for single cars or for the fleet as a whole. Fleet Mgr. knows where the cars were charged and is able to allocate costs to the respective cost-center.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Energy consumption is not available	Energy consumption cannot be used for calculations or additional services.	• Connection issues • Backend issues • Infrastructure issues • Energy provider issues
Primary actor	1594: ACT Fleetmanager		
Secondary actors	132: ACT EVSE Operator 128: ACT EVSP (Electric Vehicle Service Provider) as “Fleet Provider”		
Main scenario	fleet manager opens the car information page of the fleet management system, fleet manager looks at the history and current consumption of a car		
Alternatives	Car has energy consumption locally available and total calculations are done by hand.		
Variations			
Related information			
Issues			

3.4.4 1320 FTR CO2 intensity of driving

This feature will provide information on CO2 emissions of charging and driving. Information as average CO2 level (per charge!) fed into the vehicle will be combined with the mileage driven into an overall CO2 impact of a vehicle (absolute value of CO2 emitted g CO2/km).

In order to support the offer of this service described above, it is necessary that the carbon footprint of each charging event, which is routed via the market place, is captured and documented. A service provider (e.g. OEM, Utility, IT-Service-Provider) connected to the market place can perform a carbon intensity certification for a specific vehicle, a whole fleet or specific driver(s) on request.

The realization of this feature requires[5]:

- caption of the carbon intensity of the charged electricity in g CO2/ kWh in the CDR,
- caption of the mileage of the vehicle at charging in the CDR together with the VIN (vehicle identification number),
- Access for the assigned Service Provider to the data (CDR) that is related to all charging events of the relevant vehicle(s) or driver(s) in order to analyze and aggregate the carbon & vehicle related data to the overall CO2 impact of a vehicle.

An important issue is an agreement on the methodology of the carbon intensity of the electricity. It needs to be agreed if only the power plant emissions are considered (e.g. wind electricity 0 g/kWh) or if the pre-chain such as the hardware production and fuel provision is included as well (e.g. wind electricity ~ 5-10 g

[5] Requirements are subject to implementation and may vary from the hereby suggested procedure

CO2/kWh). Secondly it needs to be agreed if only CO2 emissions are considered or if other emissions, contributing to global warming (e.g. methane) are considered as well, resulting in a CO2 equivalent figure.

Concerning the provision of the carbon intensity of the electricity provided at the charging point, it is recommend that the EVSE operator has to provide this figure and include it in the CDR, however, the question of certification of this figure by an independent certification body needs to be discussed.

3.4.4.1 1592 UC CO2 Reporting

Scope & Level	Reduction of carbon emission is a major political goal for electric mobility. This Use Case will provide information on CO2 emissions of charging and driving in order to allow a monitoring of fleets. Information as average CO2 level (per charge!) fed into the vehicle will be combined with the mileage driven into an overall CO2 impact of a vehicle (absolute value of CO2 emitted g CO2/km) and the energy efficiency in kWh/ km driven.		
Goal in context	The carbon footprint for an individual EV is calculated for a given period.		
Preconditions	• The EV or the EV Driver needs to have a contract with the EVSP (unique contract ID) • The EV can be identified by a unique VIN (vehicle identification number) • The CDRs are stored in the EVSP backend and are accessible for a Service Provider (could be the EVSP as well) that offers the service of generating a CO2 report for a given EV/ EV Driver Contract (Service provider can request a search to and receives all CDRs that contain the VIN) • CO2 intensity is available either provided by the EVSE Operator and captured in the CDR or provided by UC 1561 • The EVSP logs mileage data for every charging and stores this information in the EVSP backend (e.g. by writing in the CDR). Mileage data needs to be provided by the OEM Backend or directly by the EV.		
Successful outcome	A Report is generated that states the carbon footprint and the energy efficiency for an individual EV for a given period (e.g. one calendar year). The carbon footprint is stated in absolute values (mass of CO2 emitted within the period) and on a specific basis (CO2 emitted per km driven) as well as the specific energy consumption (kWh/km).		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	no CO2 intensity of charged energy available	to be discussed: Alternative 1: no CO2 report available Alternative 2: CO2 intensity of the electricity mix of the relevant country is used	Availability of information of the CO2 intensity of the European countries in the market place as precondition for Alternative 2
	charging event outside the market place in between (e.g. @ household socket)	Too low carbon footprint and specific energy consumption if no plausibility check is made.	No plausibility check in combination is performed; this plausibility check could prevent the outcome and a corrected report would be generated instead.
Primary actor	136: ACT Marketplace Operator 128: ACT EVSP (Electric Vehicle Service Provider)or 137: ACT Service Provider authorized by 133: ACT Vehicle Driver		

Secondary actors	133: ACT Vehicle Driver 134: ACT OEM
Main scenario	• Select an EV/ Contract that shall be analyzed for a given period • ACT Driver authorizes EVSP or other Service Provider to perform the report and access the relevant CDRs stored in the EVSP Backend • CO2 and Energy Efficiency Report is generated by including all charging events in this period
Alternatives	
Variations	Extended Preconditions: • All charging events are routed through the market place and the generated CDRs contain the VIN, the contract ID, the consumed/ charged energy including the carbon emissions (g CO2/ kWh) and the mileage of the vehicle at the charging event. Those are stored centrally in the market place. • The CDRs are stored in the market place and are accessible for a Service Provider that offers the service of generating a CO2 report for a given EV/ EV Driver Contract (Service provider can request a search to the market place and receives all CDRs that contain the VIN). Based on these extended preconditions, this use case could also cover a CO2 reporting with more than one contract for one vehicle.
Related information	The CDRs for a specific vehicle need to be accessible (see preconditions and variations). In addition the CO2 intensity needs to be reported for every charging event by the EVSE and included in the CDR together with the vehicle information (VIN, consumed energy, mileage)
Issues	An important issue is an agreement on the methodology of the carbon intensity of the electricity. It needs to be agreed if only the power plant emissions are considered (e.g. wind electricity 0 g/kWh) or if the pre-chain such as the hardware production and fuel provision is included as well (e.g. wind electricity ~ 5-10 g CO2/kWh). Secondly it needs to be agreed on, whether only CO2 emissions are considered or if other emissions, contributing to global warming (e.g. methane) are considered as well, resulting in a CO2 equivalent figure. Concerning the provision of the carbon intensity of the electricity provided at the charging point, it is recommend that the EVSE operator has to provide this figure and include it in the CDR, however, the question of certification of this figure by an independent certification body needs to be discussed.

4 Roaming functional domain use case model

4.1 Overview

Roaming of EV related services occurs when a service is contracted between consumer A and provider B, but is delivered to consumer A by provider C, based on a contract between provider B and provider C.

The following picture illustrates the Roaming Process

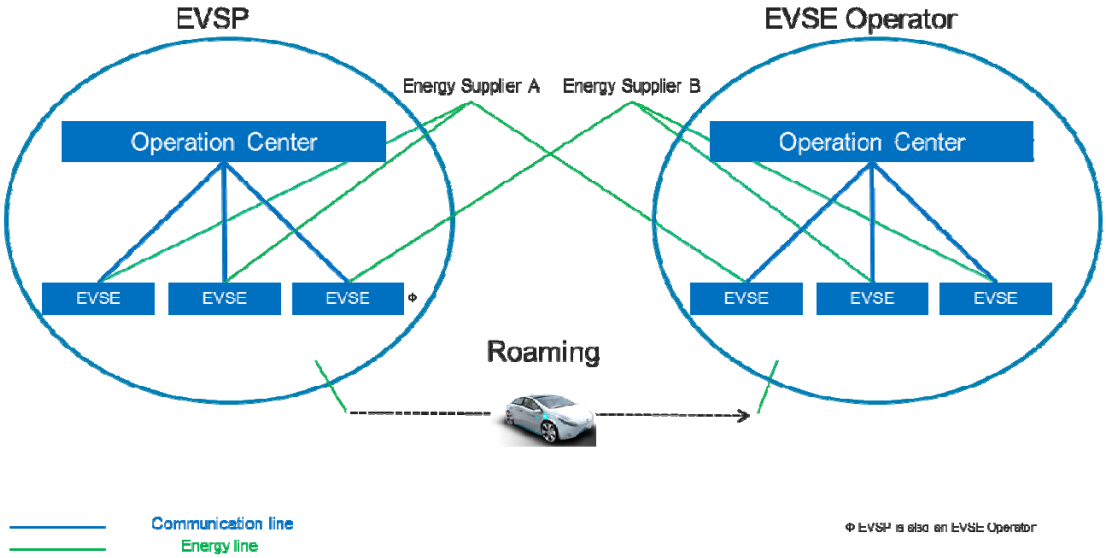


Figure 12 Roaming as defined by Betterplace

The Roaming functional domain is divided into two different clearing aspects, the Contractual Clearing and the Financial Clearing, as well as two different localization approaches, the intra-country and inter-county roaming.

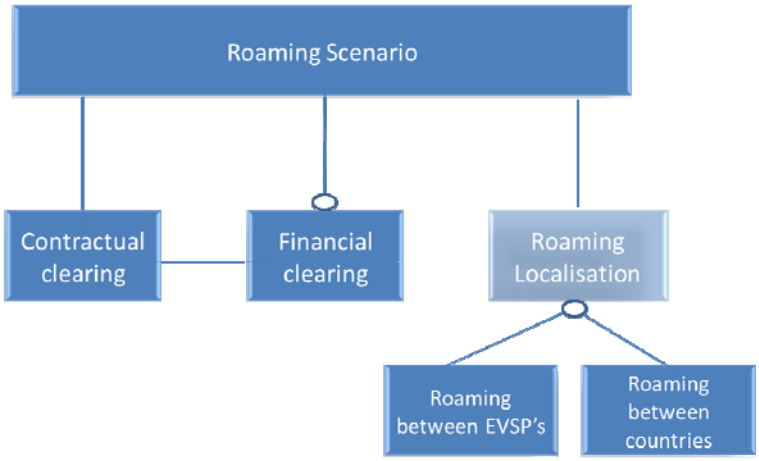


Figure 13 Structure of the Roaming Domain

Contractual Clearing deals with validation of contracts between different EVSE Operators and EVSPs as well as their respective customers. This aspect is the most important one for the Green eMotion project in order to be able to charge at different EVSE using one single contract with one EVSP. The Financial Clearing which deals with a consolidated rating and billing will be only discussed but most probably not realized. From the localization perspective, both approaches will be realized.

Roaming services can be handled in a bilateral agreement between an EVSE operator and an EVSP or with a Clearing House to handle the contractual and/or financial clearing between the EVSE operator and the EVSP.

These two variations are illustrated below:

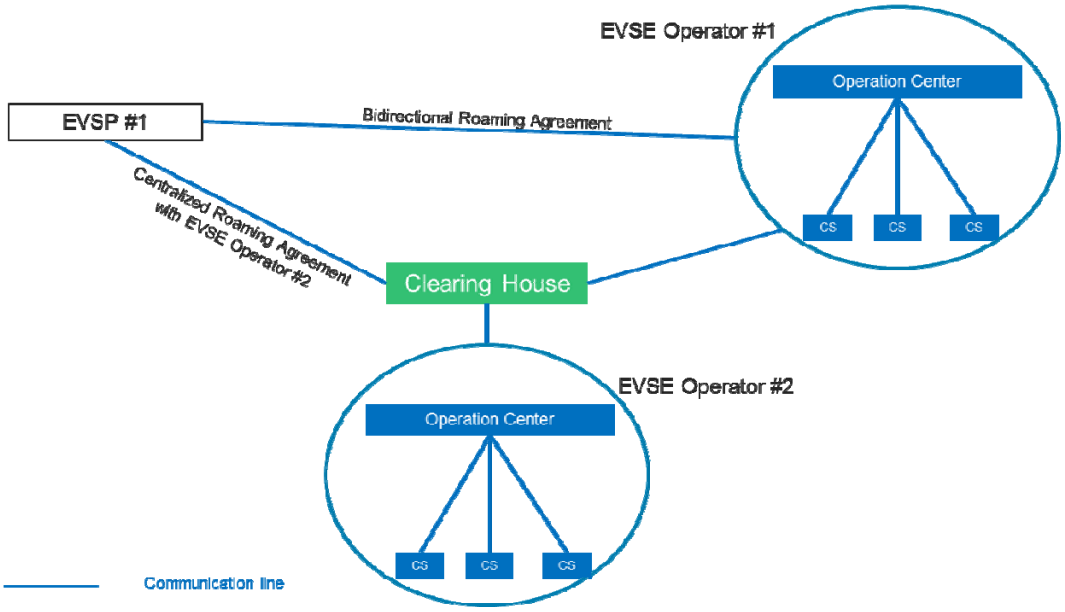


Figure 14 Two Roaming variations

Note: In the 2nd release further use cases and features of roaming will be developed and demonstrated, reflecting the experiences with bilateral roaming, roaming facilitated by clearing house and open access in release 1.

The two main processes in Contractual Clearing are 'Authorization' and 'CDR forwarding'. The following paragraphs and process diagrams show the tasks each role has to execute in order to complete the process.

4.1.1 Authorization

As a first step an EV-driver has to identify himself. The identification method used (e.g. RFID card) is not relevant to the authorization process itself. The identity information includes a ContractID, but no details about the contract.

Once the EV-driver is identified, the EVSE can apply an internal white or blacklist to perform a pre-check for that particular card. If the identity is in a white list, the charging process can start immediately.

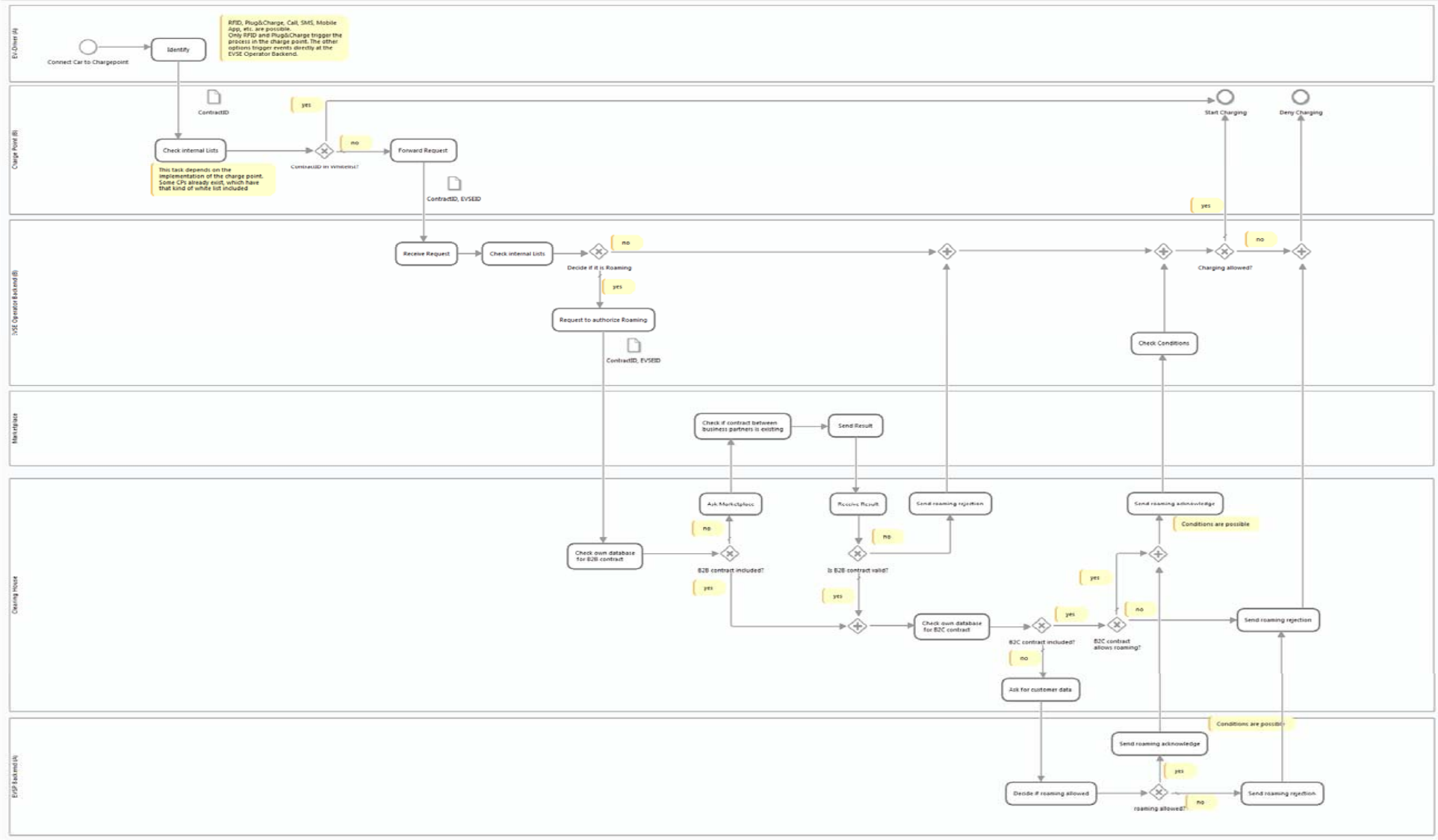


Figure 15 Roaming Domain - Authorization Process

If the identity is in a black list this would lead to an instant denial of charging. If the identity is neither whitelisted nor blacklisted, the charge request is forwarded to the EVSE's Operator Backend, were the whitelist/blacklist concept can be applied again. This would most probably occur when the EVSE operator is also an EVSP or has some maintenance or master cards for his infrastructure.

If the identity is not white- or blacklisted at the EVSE Operator Backend either, it is unknown to the EVSE Operator. This signifies a Roaming scenario. In this case the EVSE Operator Backend forwards the charge request either to the EVSP as identified by the ContractID (i.e. bilateral roaming) or to a Clearing-house (i.e. centralized roaming agreements).

In case of centralized roaming agreements, the Clearinghouse validates the B2B contract between the EVSE operator, and the EVSP of the EV-Driver(identified by the ContractID). The Clearinghouse uses the marketplace for this validation: the B2B contract details are not available to the Clearinghouse.

If a valid B2B contract between EVSE Operator and EVSP is in place, the EV Drivers right to use this contract remains to be validated. For this the Clearinghouse may check its own database or ask the EVSP. Now the Clearinghouse may send and a roaming acceptance or rejection back to the EVSE op-erator backend where the charging request came from.

4.1.2 CDR forwarding

After some entity of the charging chain ends the roaming charging process, the EVSE operator backend sends the corresponding CDR to either the EVSP in case of bilateral roaming or to the clearing house in case of centralized agreements. In case of the latter, the CDR is then validated and forwarded to the EVSP which is responsible for the customer who charged his car.

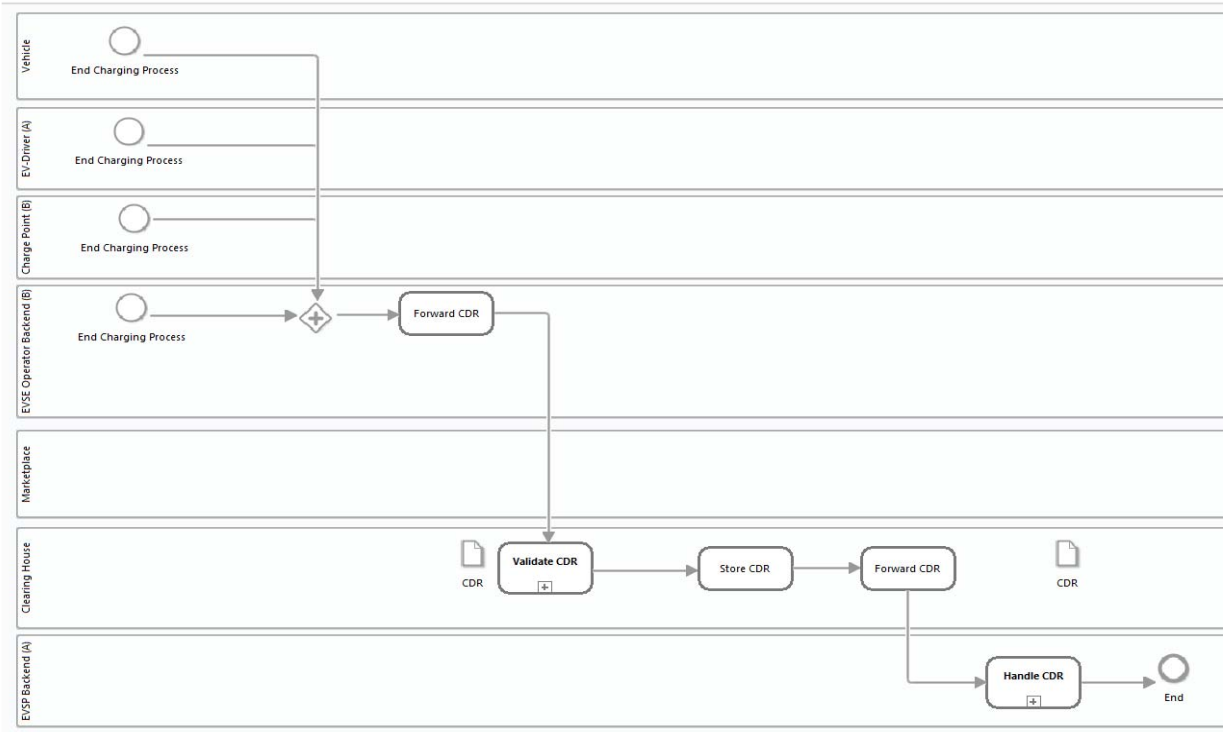


Figure 16 Forward CDR – Process flow

4.2 Actors

The following table lists the identified Actors in the Roaming domain.

ID	Actor	Description
140	ACT Clearinghouse	authenticates and processes contractual and financial transactions
129	ACT DSO Distribution system operator	Provides the power connection point to the charging spot.
143	ACT EV (Electric Vehicle)	Provides access to the vehicle data
1539	ACT EVCC Electric Vehicle Communication Controller	embedded system, within the vehicle, that implements the communication between the vehicle and the SECC in order to support specific functions
131	ACT EVSE (Electric Vehicle Supply Equipment)	is used to exchange energy between the EV and the Grid
1406	ACT EVSE Backend	Backend, administrative systems of the EVSE Operator, as opposed to frontend, on-site systems that communicate directly with EV's
132	ACT EVSE Operator	in charge of managing the EVSEs
128	ACT EVSP (Electric Vehicle Service Provider)	offers e-mobility services to the end customers
1407	ACT EVSP Backend	Backend, administrative systems of the EVSP
1540	ACT HMI Human Machine Interface	interface allowing the vehicle user to receive information relative to the charging process and provide input to the charging system
136	ACT Marketplace Operator	Operates the platform and communications, and manages access to and working of the marketplace
1541	ACT SECC Supply Equipment Communication Controller	implements the communication to one or multiple EVCCs
133	ACT Vehicle Driver	Human, currently driving the Vehicle

Table 4.9 Roaming Domain - Actors

4.3 Features and Use Cases

4.3.1 Overview

The following table lists the Roaming Features and their Use Cases.

ID	Feature	Realized By
985	FTR Roaming in same country using Clearing House	1512 UC Start a roaming charging process with Clearinghouse 1502 UC EV Identification, Authentication and Authorization 1518 UC During charging 1511 UC End a roaming charging process with Clearinghouse
986	FTR Roaming in different countries using Clearing House	1502 UC EV Identification, Authentication and Authorization 1518 UC During charging 1511 UC End a roaming charging process with Clearinghouse 1512 UC Start a roaming charging process with Clearinghouse
1804	FTR Roaming based on bilateral agreements	1502 UC EV Identification, Authentication and Authorization 1518 UC During charging
981	FTR Authentication	1518 UC During charging 1512 UC Start a roaming charging process with Clearinghouse
982	FTR CLEARING Validation of contract	1512 UC Start a roaming charging process 1497 UC Create EVSP/EVSE Contract within Clearing House 1514 UC Create Customer Contract by Service Provider in Clearing House
984	FTR CLEARING Forwarding CDR	1511 UC End a roaming charging process with Clearinghouse
1291	FTR CLEARING Managing EVSP data	1500 UC Change EVSP/EVSE Contract within Clearing House 1512 UC Start a roaming charging process with Clearinghouse 1513 UC Delete EVSP/EVSE Contract from Clearing House 1497 UC Create EVSP/EVSE Contract within Clearing House
983	FTR CLEARING Managing customer data	1512 UC Start a roaming charging process with Clearinghouse 1516 UC Delete Customer Contract by Service Provider from Clearing House 1514 UC Create Customer Contract by Service Provider in Clearing House 1515 UC Change Customer Contract by Service Provider in Clearing House 1517 UC Change Customer Contract by Customer himself within Clearing House

Table 4.10 Roaming Domain - Features and their Use Cases

4.3.2 985 FTR Roaming in same country using Clearing House

The feature will allow for roaming between two EVSPs which are located in the same country. A customer of EVSP A will be able to charge at an EVSP B's infrastructure. The contractual clearing will be done via this feature.

At the moment roaming in the same country is be less complex than roaming between different countries, since applicable legal preconditions, tax systems and energy market behavior will be the same inside a single country.

4.3.2.1 1512 UC Start a roaming charging process with Clearinghouse

Scope & Level	Clearing Service. Trigger to start a roaming charge after the transaction has been validated by the clearinghouse.		
Goal in context	Start of a cleared roaming charging process.		
Preconditions	Involved EVSPs/EVSE operators have valid roaming contracts the Clearing House has access to. Driver has valid roaming contract with an EVSP. Pending charging request that requires roaming. ContractID is part of the charging request of the EVSE operator.		
Successful outcome	Charging Process successfully starts.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Authorization messages are not sent.	Charging cannot start.	• Connectivity issues • Backend issues • EVSP backend / EVSE operator backend has sent wrong data
Primary actor	131: ACT EVSE Operator Backend 128: ACT EVSP Backend		
Secondary actors	136: ACT Marketplace Operator 140: ACT Clearinghouse		
Main scenario	clearing house gets a charge request, clearing house checks the available contracts and clears the request accordingly, clearing house notifies the requesting EVSE operator backend		
Alternatives	Charging is started anyway and customer is billed directly at charge point site.		
Variations	Authorization is done bilaterally between EVSPs/EVSE operators.		
Related information	see Business Process Diagram Contractual Clearing - Authorization 1270		
Issues			

4.3.2.2 1502 UC EV Identification, Authentication and Authorization

This Use Case is listed before in this Chapter, please refer to paragraph 2.4.3.1

Scope & Level	Basic end-user services. This use case covers identification of contract belonging to a user (own customer or roamer) at a charge spot or battery switch station, and his authentication and authorization to execute the process of charging or battery switching). Use case describes the interaction between EV/ EV driver, EVSP, EVSE operator and optionally the Clearinghouse (when roaming).

4.3.2.3 1518 UC during charging

This Use Case is listed before, please refer to paragraph 2.5.3.1

Scope & Level	End-user services. This use case covers the enhanced connect - charge - disconnect cycle (FTR1358) with additional services. Use case describes interaction between EV driver, EVSE Backend and optional 3rd parties (Energy trader, DSO, public sector) **Note** that Identification, Authentication and Authorization is a separate Use Case (UC 1502) but parties may choose to implement UC 1502 within the connect-charge-disconnect cycle

4.3.2.4 1511 UC End a roaming charging process with Clearinghouse

Scope & Level	Clearing Service. This use case is an internal clearinghouse procedure serving 2 business stakeholders: EVSP/EVSE operator.		
Goal in context	EVSPs receive correct CDRs in order to enable billing, reporting and statistics		
Preconditions	Charging via active Roaming Charging Process.		
Successful out-come	Charging Process successfully ends. CDRs are routed correctly.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to out-come**
	Failure to send CDR	CDR is not received and billing cannot be calculated correctly.	• Connectivity issues • Backend issues
	CDR contains wrong but con-sistent data	Wrong data is transmitted. Billing calculations are faulty.	• EVSP backend / EVSE operator backend has sent wrong data
Primary actor	131: ACT EVSE Operator Backend 128: ACT EVSP Backend		
Secondary actors	136: ACT Marketplace Operator 140: ACT Clearinghouse		
Main scenario	Information about end of charging process is send from EVSE operator backend to clearing house in form of a CDR, CDR is evaluated by clearing house and for-warded to responsible EVSP backend		
Alternatives			
Variations			
Related informa-tion	see Business Process Diagram 1425 Contract Clearing - CDR Forwarding		
Issues			

4.3.3 986 FTR Roaming in different countries using Clearinghouse

This feature will allow two different EVSPs which are located in different countries to provide their customers with a roaming opportunity. A customer of EVSP A and country X will be allowed to charge on infrastructure of EVSP B in country Y. The Clearing House will facilitate the platform for that.

At the moment we see that roaming in different countries is more complex than roaming in the same country because of differences in legal preconditions, tax systems and energy market behavior between countries.

4.3.3.1 1502 UC EV Identification, Authentication and Authorization

This Use Case is listed before in this Chapter, please refer to paragraph 2.4.3.1

Scope & Level	Basic end-user services. This use case covers identification of contract belonging to a user (own customer or roamer) at a charge spot or battery switch station, and his authentication and authorization to execute the process of charging or battery switching). Use case describes the interaction between EV/ EV driver, EVSP, EVSE operator and optionally the Clearinghouse (when roaming).

4.3.3.2 1518 UC during charging

This Use Case is listed before in this Chapter, please refer to paragraph2.5.3.1

Scope & Level	End-user services. This use case covers the enhanced connect - charge - disconnect cycle (FTR1358) with additional services. Use case describes interaction between EV driver, EVSE Backend and optional 3rd parties (Energy trader, DSO, public sector) **Note** that Identification, Authentication and Authorization is a separate Use Case (UC 1502) but parties may choose to implement UC 1502 within the connect-charge-disconnect cycle

4.3.3.3 1511 UC End a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.4

Scope & Level	Clearing Service. This use case is an internal clearinghouse procedure serving 2 business stakeholders: EVSP/EVSE operator. It has no functional effect on the end user.

4.3.3.4 1512 UC Start a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.1

Scope & Level	Clearing Service. Trigger to start a roaming charge after the transaction has been validated by the clearinghouse.

4.3.4 1804 FTR Roaming based on Bilateral Agreements

When Roaming without clearing house to handle contracts and financial clearing, the interaction between EV Driver (“subscriber”), EVSE (“charge spot”), EVSE operator (Charge Network Operator) and EVSP (Electric Car Home Operator) will follow a specific procedure, as illustrated below.

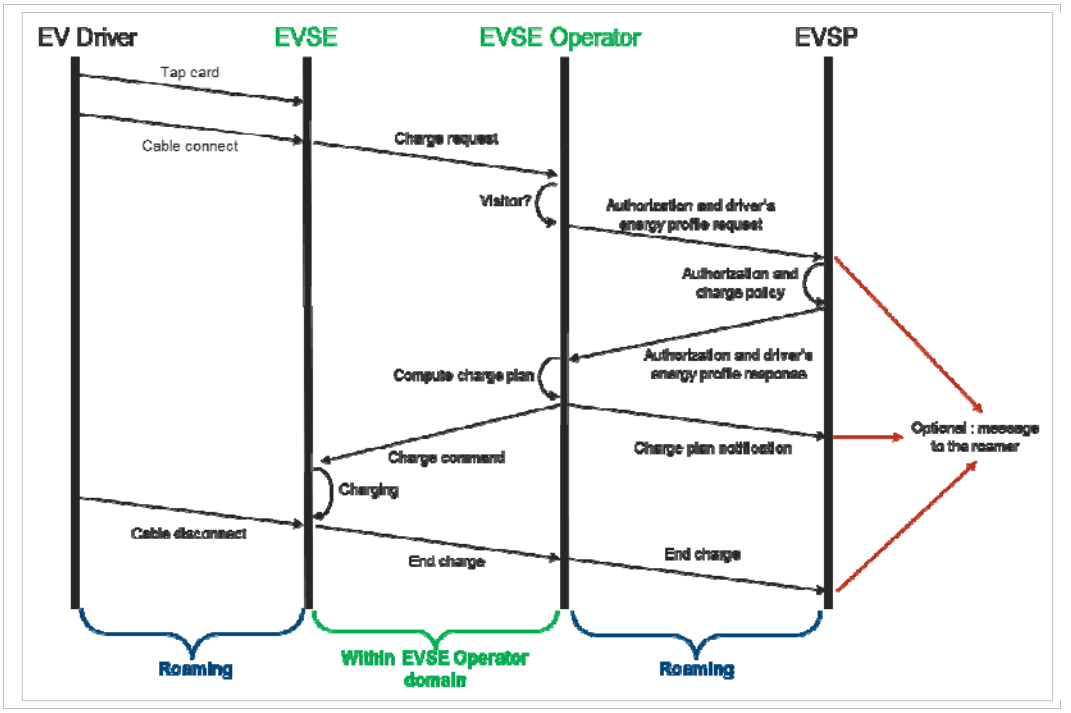


Figure 17 Communication process for Roaming by bi-lateral agreements

Just as when Roaming using a Clearinghouse, there will be differences between National and International Roaming based on local regulations. These differences will be covered by the specific agreements, and are not specified any further is the current context.

4.3.4.1 1502 UC EV Identification, Authentication and Authorization

This Use Case is listed before in this Chapter, please refer to paragraph 2.4.3.1

Scope & Level	Basic end-user services. This use case covers identification of contract belonging to a user (own customer or roamer) at a charge spot or battery switch station, and his authentication and authorization to execute the process of charging or battery switching). Use case describes the interaction between EV/ EV driver, EVSP, EVSE operator and optionally the Clearinghouse (when roaming).

4.3.4.2 1518 UC During charging

This Use Case is listed before in this Chapter, please refer to paragraph 2.5.3.1

Scope & Level	End-user services. This use case covers the enhanced connect - charge - disconnect cycle (FTR1358) with additional services. Use case describes interaction between EV driver, EVSE Backend and optional 3rd parties (Energy trader, DSO, public sector) **Note** that Identification, Authentication and Authorization is a separate Use Case

	(UC 1502) but parties may choose to implement UC 1502 within the connect-charge-disconnect cycle

4.3.5 981 FTR Authentication

This feature applies when an EV driver seeks to charge at a public EVSE, which might not be operated by the EV Service Provider that this driver has a contract with.
The Clearinghouse checks whether agreements for that customer or his service provider do exist. If so, it provides an indication of what services the customer might be is allowed to consume and provides that information to the EVSE which can then, e.g., start the charging process.
To trigger the feature, an EVSE operator has to contact the clearing house.

4.3.5.1 1518 UC During charging

This Use Case is listed before, please refer to paragraph 2.5.3.1

Scope & Level	End-user services. This use case covers the enhanced connect - charge - disconnect cycle (FTR1358) with additional services. Use case describes interaction between EV driver, EVSE Backend and optional 3rd parties (Energy trader, DSO, public sector) **Note** that Identification, Authentication and Authorization is a separate Use Case (UC 1502) but parties may choose to implement UC 1502 within the connect-charge-disconnect cycle

4.3.5.2 1512 UC Start a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.1

Scope & Level	Clearing Service. Trigger to start a roaming charge after the transaction has been validated by the clearinghouse.

4.3.6 982 FTR CLEARING Validation of contract

This scenario applies when an EV driver seeks to charge at a public or semi-public EVSE, which might not be operated by the EV Service Provider that this driver has a contract with. The clearing house checks whether existing agreements for that customer or his service provider are in place and provides an indication of what services the customer might be allowed to consume and provides that information to the EVSE which can then, e.g., start the charging process.

The contractual data or at least a subset can be stored in the clearing house directly. If an EVSE operator or EVSP is not willing to store the needed contractual information in the clearing house, the CH will send a request directly to them. A service to retrieve the information has to be implemented by that partner.
One argument for the storage of a basic sub set of contractual/customer data in the clearing house is performance. The Clearing House can answer the request of the EVSE operator / EVSP much faster than it would be if the clearing house has to ask the corresponding EVSP for the required data. Based on that faster answer, the customer gets the response of the charge point, if he is allowed to charge, also faster.

4.3.6.1 1512 UC Start a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.1

Scope & Level	Clearing Service. Trigger to start a roaming charge after the transaction has been validated by the clearinghouse.

4.3.6.2 1497 UC Create EVSP/EVSE Contract within Clearing House

Scope & Level	Clearing Service. This use case is an internal clearinghouse procedure serving 2 business stakeholders: EVSP/EVSE operator. It has no functional effect on the end user. Non-functional improvement is the increased speed of data processing.		
Goal in context	Create an EVSP/EVSE operator contract within the Clearing House in order to enable faster roaming decisions.		
Preconditions	• Marketplace is operational • Business Partner is authorized for Clearing Services and enlisted in the Marketplace		
Successful outcome	Contract is created within the Clearing House		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Contract cannot be created	No Contract in the Clearing House all clearing requests have to go full round trip	• inconsistent data scheme • backend errors
Primary actor	131: ACT EVSE (Electric Vehicle Supply Equipment) 128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	136: ACT Marketplace Operator 140: ACT Clearinghouse		
Main scenario	Marketplace sends information about new EVSP/EVSE operator backend contract to clearing house, clearing house stores information locally		
Alternatives	Data is only stored at EVSE operator backend/EVSP backend. Clearing requests have to go full round trip each time.		
Variations	Contracts are created within Marketplace and the Clearing House has access to them.		
Related information			
Issues			

4.3.6.3 1514 UC Create Customer Contract by Service Provider in Clearing House

Scope & Level	Clearing Service. This use case triggers the enablement of the roaming agreement with the end user for the Clearing House functionality.		
Goal in context	A Service Provider wants to initially create a contract for one of his customers and populate that information to the Clearing House in order to enable faster roaming decisions.		
Preconditions	• Marketplace is operational • Business Partner is authorized for Clearing Services and enlisted in the Marketplace		
Successful outcome	Customer contract is created within the Clearing House		
Failure outcomes	Failure	Outcome	Condition leading to outcome
	Customer contract cannot be created	No Contract in the Clearing House all clearing requests have to go full round trip	• inconsistent data scheme • backend errors
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	140: ACT Clearinghouse 136: ACT Marketplace Operator		
Main scenario	EVSP sends information about new customer contract to clearing house, clearing house stores that information		
Alternatives	Data is only stored at EVSP backend. Clearing requests have to go full round trip each time.		
Variations	Customer contracts are created within Marketplace and the Clearing House has access to them.		
Related information			
Issues			

4.3.7 984 FTR CLEARING Forwarding CDR

A Charge Detail Record (CDR) is generated for each charging event that goes through the clearing house. At the end of a charging process, the CDR is sent from the EVSE operator backend to the clearing house. The clearing house validates the CDR and transmits it to the EVSP that serves the EV driver that is related to the charging event.
In order to understand the process better, have a look at the business process diagram Contractual Clearing - CDR Forwarding (1452).

4.3.7.1 1511 UC End a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.4

Scope & Level	Clearing Service. This use case is an internal clearinghouse procedure serving 2 business stakeholders: EVSP/EVSE operator. It has no functional effect on the end user.

4.3.8 1291 FTR CLEARING Managing EVSP data

This feature manages the EVSP data. That means that EVSP can only register its customers if the EVSP itself is registered as such in the clearing house. For the EVSP it is mandatory to state its roaming partners. Also the standard CRUD (create, read, update, delete) operations have to be in place.

4.3.8.1 1500 UC Change EVSP/EVSE Contract within Clearing House

Scope & Level	Clearing Service. This use case is an internal clearinghouse procedure serving 2 business stakeholders: EVSP/EVSE operator. It has no functional effect on the end user.		
Goal in context	Change an EVSP/EVSE operator contract within the Clearing House in order to keep in sync with contractual changes.		
Preconditions	• Contract already exists in Clearing House • Marketplace is operational • Business Partner is authorized for Clearing Services and enlisted in the Marketplace		
Successful outcome	Contract is updated within the Clearing House		
Failure outcomes	Failure	Outcome	Condition leading to outcome
	Contract cannot be changed	Inconsistent state	• inconsistent data scheme • backend errors
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider) 131: ACT EVSE (Electric Vehicle Supply Equipment)		
Secondary actors	140: ACT Clearinghouse 136: ACT Marketplace Operator		
Main scenario	marketplace sends update information regarding a EVSP/EVSE operator contract to the clearing house, clearing house stores the changes		
Alternatives	Data is only stored at EVSE operator backend / EVSP backend. Clearing requests have to go full round trip each time.		
Variations	Contracts are changed within Marketplace and the Clearing House has access to them.		
Related information			
Issues			

4.3.8.2 1512 UC Start a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.1

Scope & Level	Clearing Service. Trigger to start a roaming charge after the transaction has been validated by the clearinghouse.

4.3.8.3 1513 UC Delete EVSP/EVSE Contract from Clearing House

Scope & Level	Clearing Service. This use case enables EVSE operators and EVSPs to end their mutual relation tracked by the clearing house		
Goal in context	EVSP/EVSE operator wants to end their mutual contract so that the clearing house is informed about the changes		
Preconditions	Contract already exists in the clearing house Marketplace is operational Business Partner is authorized for clearing services and enlisted in the Marketplace		
Successful outcome	Contract is disabled within the clearing house.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Contract cannot be deleted	Clearing requests are still granted	• faulty API call • backend errors • connectivity issues
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider) 131: ACT EVSE (Electric Vehicle Supply Equipment)		
Secondary actors	136: ACT Marketplace Operator 140: ACT Clearinghouse		
Main scenario	EVSP or EVSE operator wants to end their mutual relation, the marketplace can send an update to the clearing house, clearing house disables the specific contract		
Alternatives	-		
Variations	-		
Related information	-		
Issues	Contracts cannot be deleted completely. They only should be deactivated in order to prevent history data loss.		

4.3.8.4 1497 UC Create EVSP/EVSE Contract within Clearing House

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.6.2

Scope & Level	Clearing Service. This use case is an internal clearinghouse procedure serving 2 business stakeholders: EVSP/EVSE operator. It has no functional effect on the end user. Non-functional improvement is the increased speed of data processing.

4.3.9 983 FTR CLEARING Managing customer data

In order to enable high performance clearing requests, a white list concept for customer charging authorization is introduced within the clearing house.

Anonymous customer data references can be managed directly within the scope of the clearing house. The EVSPs can store such B2C data directly in the clearing house. By doing this the clearing house can accept or reject roaming charging requests directly without having to trigger external systems each time. This keeps the round trip time as low as possible. The load is taken off the EVSP Backend in that case

and EVSPs can advertise a fast start of roaming charging processes. (To see the process in detail, have a look at the business process diagram Contractual Clearing - Authorization 1270)

It is important that the data keeps in sync with the binding customer data at the EVSP. Therefore the typical CRUD (creates read update and delete) operations will be supported via APIs, so that syncing can be triggered from external systems such as EVSP Backends or the marketplace.

4.3.9.1 1512 UC Start a roaming charging process with Clearinghouse

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.2.1

Scope & Level	Clearing Service. Trigger to start a roaming charge after the transaction has been validated by the clearinghouse.

4.3.9.2 1516 UC Delete Customer Contract by Service Provider from Clearing House

Scope & Level	Clearing Service. This use case allows the Service provider to delete a customer contract from the Clearing house. This is an internal Clearing house characteristics and has no functional effect on the end user.		
Goal in context	A Service Provider wants to delete a contract of one of his customers from the Clearing House		
Preconditions	• Customer contract already exists in the Clearing House • Marketplace is operational • Business Partner is authorized for Clearing Services and enlisted in the Marketplace		
Successful outcome	Customer contract is disabled within the Clearing House.		
Failure outcomes	Failure	Outcome	Condition leading to outcome
	Customer contract cannot be deleted	Clearing requests are still granted	• faulty API call • backend errors • connectivity issues
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	140: ACT Clearinghouse 136: ACT Marketplace Operator		
Main scenario	EVSP sends information about deletion of a customer contract to clearing house, clearing house deactivates the customer contract		
Alternatives	-		
Variations	-		
Related information	-		
Issues	Customer contracts cannot be deleted completely. They only should be deactivated in order to prevent history data loss.		

4.3.9.3 1514 UC Create Customer Contract by Service Provider in Clearing House

This Use Case is listed before in this Chapter, please refer to paragraph 4.3.6.3

Scope & Level	Clearing Service (BS Contractual Clearing): This use case triggers the enablement of the roaming agreement with the end user for the Clearing House functionality.

4.3.9.4 1515 UC Change Customer Contract by Service Provider in Clearing House

Scope & Level	Clearing Service. This use case allows the service provider to make changes to the customer contract in the clearing house. Use case represents no functional changes to the end user.		
Goal in context	Service Provider changes customer contract details which are stored in the Clearing House.		
Preconditions	• Customer contract already exists in Clearing House • Marketplace is operational • Business Partner is authorized for Clearing Services and enlisted in the Marketplace		
Successful outcome	Customer contract is updated within the Clearing House		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Customer contract cannot be changed	Inconsistent state	• inconsistent data scheme • backend errors
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	136: ACT Marketplace Operator 140: ACT Clearinghouse		
Main scenario	EVSP sends update information of a customer contract to the clearing house, clearing house stored the changes		
Alternatives	Data is only stored at EVSP backend. Clearing requests have to go full round trip each time.		
Variations	Customer contracts are changed within Marketplace and the Clearing House has access to them.		
Related information			
Issues			

4.3.9.5 1517 UC Change Customer Contract by Customer himself within Clearing House

Scope & Level	Clearing Service. End user is enabled to directly make changes to his roaming agreement or EVSP contract and this will be automatically recorded in the clearing house.
Goal in context	The customer, who has already a contract with an EVSP which is stored in the Clearing House, wants to change some contract detail which he is allowed to change.
Preconditions	• Customer contract already exists in Clearing House • Marketplace is operational • Business Partner (Customer) is authorized for Clearing Services and has ac-

	cess to the Marketplace		
Successful outcome	Customer contract is updated within the Clearing House		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Customer contract cannot be changed	Update not possible.	• inconsistent data input • backend errors
Primary actor	133: ACT Vehicle Driver		
Secondary actors	136: ACT Marketplace Operator 128: ACT EVSP (Electric Vehicle Service Provider) 140: ACT Clearinghouse		
Main scenario	Customer of EVSP sends changes in his contract to clearing house, clearing house stores the changes		
Alternatives	Data is only stored at EVSP backend. Clearing requests have to go full round trip each time.		
Variations	Customer contracts are changed within Marketplace and the Clearing House has access to them.		
Related information			
Issues			

5 Energy functional domain use case model

5.1 Overview

The energy functional domain consists of one main business scenario, which is based on the idea of a centralized grid congestion management leveraging the smart metering backbone (for conventional energy market) and smart recharging infrastructure (for brand new electric mobility market) as deployed for example by Enel in Italy.

This scenario is based on the basics of remote grid management, with the possibilities to enhance functionalities through the electric mobility infrastructures and exploit new services and opportunities in the smart-grid market, of which electric mobility is the very first operative example.

The scenarios that may be embedded in this functional domain are depicted on the graph below. Optional functions of the electric mobility marketplace would include services that operate within this domain providing congestion management eventually together with the use of the aggregator role and aggregated energy trading services (referred as Virtual Power Plant, VPP).

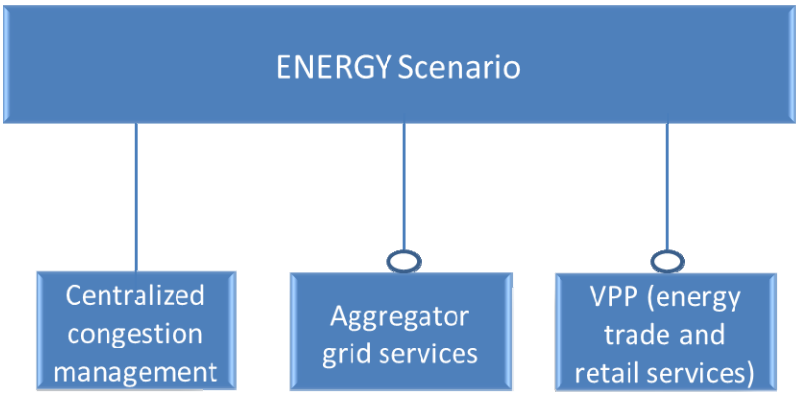


Figure 18 Structure of the Energy Domain

5.1.1 End user perspective

From the End user perspective, the main Features (services) that have developed from these scenarios are History of the EVSE use, which allows EV drivers to control the status of the charge, see the locations, level of service, consumed energy, etc., and congestion management (also with V2G perspective) related services. The former service would be eventually provided by EVSE Operators in the marketplace and EVSP would request it for their customers, while the latter services consist in a broad variety of solutions to make use of the energy stored in the customer's EV in order to sustain grid management or resell energy. This service would eventually be published from an EVSP into the marketplace and DSO, TSO or Energy Vendor may request it. The most advanced congestion management services related to V2G will mean a source of income to the EV owners, as the use of their vehicles will be rewarded by service requestors, or in case of vehicle to home, the EV owners will be able to opt for cheaper electricity contracts for their homes.

5.1.2 Business to business perspective

In the energy functional domain, the most important benefits of the Marketplace lay in the business to business sphere. The one service, or benefit with highest value is in allowing the grid operator to realize congestion management by controlling the load of the vehicles. This service can be used in case of emergency (to prevent black-outs, brown-outs or to help to restart the grid after a black-out) or to perform active grid management by the DSO, who would reward the provider of such availability. Obviously, this is a condition that triggers several requirements in the whole architecture of EV ecosystem. In addition, there are multiple ancillary services that can be provided to the DSO by EVSPs in the role of aggregator and in this way locally improve the quality of distributed electricity. From the trading perspective there is a similar service, however provided to the TSO or to a party responsible for its own energy profile. This service is called "Aggregated balancing to the TSO".

5.1.3 Marketplace context

The list of services described in this chapter is not exhaustive. Currently these services satisfy Business scenarios across the Energy, and Charging domains (see appendix **E**) through the features listed in the table below. The major use cases that realize the functions described in this chapter and enable the services outlined above are 1601 Provide balancing capacity, 1602 Flexible load for congestion management, and 1597 Peak shaving.

5.2 Actors

The following table lists the identified Actors in the Energy domain.

ID	Actor	Description
129	ACT DSO Distribution system operator	Provides the power connection point to the charging spot.
130	ACT Energy retailer	Delivers electricity to the charging spot
143	ACT EV (Electric Vehicle)	Provides access to the vehicle data
131	ACT EVSE (Electric Vehicle Supply Equipment)	is used to exchange energy between the EV and the Grid . This can be both “slow chargers”, “fast chargers” and “battery switch stations”.
132	ACT EVSE Operator	in charge of managing the EVSEs
1406	ACT EVSE Operator Backend	Is the backend system of the EVSE operator
128	ACT EVSP (Electric Vehicle Service Provider)	offers e-mobility services to the end customers
138	ACT Service Requester	Business Partner that consumes EV Services on the Marketplace

Table 5.11 Energy Domain - Actors

5.3 Features and Use Cases

5.3.1 Overview

The following table lists the Energy Features and their Use Cases.

ID	Feature	Realized By
972	FTR Network congestion management	1604 UC Vehicle to grid signal 1602 UC flexible load for congestion management
973	FTR Reactive power	1605 UC Reserve and activate ancillary services 1604 UC Vehicle to grid signal
974	FTR Phase balancing	1605 UC Reserve and activate ancillary services 1604 UC Vehicle to grid signal
975	FTR Ancillary services	1605 UC Reserve and activate ancillary services 1604 UC Vehicle to grid signal
971	FTR Aggregated balancing capacity to the TSO	1604 UC Vehicle to grid signal 1601 UC provide balancing capacity
965	FTR Peak shaving on MV	1597 UC Peak shaving
1317	FTR Peak shaving on LV	1597 UC Peak shaving
1313	FTR Allow interrupting	1572 UC Reduce Charge Power by DSO
961	FTR DSO predefines peaks	1597 UC Peak shaving 1596 UC Peak load threshold on a substation
966	FTR Current EV charge	1524 UC Fleet manager monitors energy consumption of pool-cars 1598 UC Aggregated EV charge overview by the DSO
1202	FTR V2G energy supply signal	1604 UC Vehicle to grid signal
560	FTR V2H supply signal	1604 UC Vehicle to grid signal
967	FTR History of EVSE use	1599 UC History of EVSE use

Table 5.12 Energy Domain - Features and their Use Cases

5.3.2 972 FTR Network congestion management

Congestion may happen within a load area under critical timeslots and massive EV penetration may jeopardize energy disposal for Energy Vendors' generic customers.

It is generally common among several regulatory framework that this topic is within the DSO duties, that is the one who manages the LV and MV grid. The DSO therefore is in charge of avoiding this hazardous condition and eventually reacts whenever network congestion within a load area is either forecasted or real-time detected, according to the technology used to monitor the energy distribution grid. Once the risk is detected, the congestion management process is run according to the DSO needs. This requires that both the EVSP and EVSE Op. are aware that their performance parameters regarding quality of service towards customers are at lower priority than the network safety and reliability. Another mandatory condi-

tion is that the recharging infrastructure is able to fulfill fast, reliable and secure communication through its back-end with the DSO.

Service contracts should always declare performances from a nominal point view. As soon as the network congestion is detected, the DSO front-end towards the electricity grid and the energy market (that together with the EVSE Op. back-ends defines the Infrastructure Management System (IMS) a multi-owners layer in the electric mobility framework) evaluates, aggregated per each EVSE Op. back-end of interest, the requested load profile allowed for EV recharging. The DSO therefore forward the power profile request to the EVSE Op. back-ends that are in charge of distributing the electric-mobility load profile over the registered EVSEs, according to their own algorithm/contractual constraints. Once the load reduction is elaborated and distributed in a granular way within all the EVSEs, the EVSE Op. back-end forward the load profile to the EVSEs that are currently in use in the specified load area where the DSO has detected the network congestion. The updated load profile is forwarded to the EV, under the assumption that the EV is able to deal with this issue and the communication EV-EVSE guarantee this information to be propagated. Therefore the EV modifies its charging pattern and feeds back power profile to the EVSE that migrates it to the EVSE Op. back-end.

The EVSE Op. back-end finally aggregates the updated power profiles gathered from the EVSEs and makes available this update to the DSO as a fulfillment of its initial request.

Use cases that realize this Feature are also illustrated in Appendix B, for more please refer to
1186 BPD Centralized Congestion Management *and*
1198 BPD Congestion Management through TOU Tariffs

5.3.2.1 1604 UC Vehicle to grid signal

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need for congestion management to multiple service providers through the marketplace.
Goal in context	An EVSP, acting as aggregator in the energy market, offers energy to DSO. This energy is retrieved from the batteries of the EVs that are connected to the recharging infrastructure in a certain timeslot. The EVSP could also be not directly acting as aggregator but in connection with it, together with other EVSPs. In order to deploy this use case, the V2G supply signaling should be accomplished following this use case.
Preconditions	• The EVSE Operator is connected to the marketplace through its backend. • The EVSP is connected to the marketplace through its backend. • The DSO is connected to the marketplace through its frontend towards the grid. • The EVSP states in its contracts with the customers that the average time of recharge is sensitive to the network safety issues and eventually to charging points priority issues (coming from the deployment strategy of the EVSE Operator). • The EV driver own EVs in which are installed batteries coming from manufacturers compliant with V2G capability • A smart recharging infrastructure is needed in order to accomplish peak predefinition demands coming from the DSO to the EVSE Operator. • The EV has adequate communication capability to receive modulation orders from the DSO through the EVSE energy gateway, especially for low power and time consuming recharges (e.g. 3.3 kW). • The EVSEs are in communication with an EVSE Operator Backend that ag-

	gregates data from each EVSE. • The EVSE Operator Backend aggregates data from each EVSE and is able to perform communication with the DSO or the marketplace where the dedicated service is running.		
Successful outcome	DSO can make use of V2G capability offered on the market according to its criteria		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSP cannot use EV for V2G.	The EV driver does not allow feed energy from his EV to the grid.	Absence of V2G condition in the contract.
	EV and EVSE cannot communicate the reverse flow of energy condition.	It is not possible to feed energy back into the grid.	Lack of communication or lack of compliancy to ISO15118 where EV-EVSE communication is available.
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider) as aggregator		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) as contributor 129: ACT DSO Distribution System Operator		
Main scenario	It is within the DSO responsibility to allow V2G to happen and release a signal to the EVSP by stating that under a specified load area the cars connected to the EVSEs are allowed to feed back into the grid a pre-settled amount of energy. A contract must be established between EVSP and DSO.		
Alternatives	The EVSP may not act as aggregator but be in contact with it together with other EVSPs. In this case, the aggregator should fulfill predefined market rules (i.e. penalties for not allowing EVSPs offer to take place if matched with DSO needs).		
Variations			
Related information	This use case shows the chance of using energy stored in the EVs as a prosumer platform for energy to be eventually fed into the LV grid. It is hereby pictured how the information and signaling regarding the V2G supply should be managed.		
Issues	Regulation and local legislation		

5.3.2.2 1602 UC flexible load for congestion management

Scope & Level	Value added service. Congestion may happen within a load area under critical timeslots and massive EV penetration may jeopardize energy disposal for Energy Vendors' generic customers.
Goal in context	This Use Case enables the use of batteries flexibility for congestion management by DSO. This topic is within the duties of the DSO that manages the LV and MV grid. The DSO therefore is in charge of avoiding this hazardous condition and eventually reacts whenever network congestion within a load area is either forecasted or real-time detected, according to the technology used to monitor the energy distribution grid. EVSEs offer a service to support the DSO which can operate selectively.
Preconditions	• The EVSE Operator is connected to the marketplace through its back-end. • The EVSP is connected to the marketplace through its back-end.

	• The DSO is connected to the marketplace through its front-end towards the grid. • The EVSP states in its contracts with the customers that the average time of recharge is sensitive to the network safety issues (peaks management from the DSO) and eventually to charging points priority issues (coming from the deployment strategy of the EVSE Operator). • A smart recharging infrastructure is needed in order to accomplish peak pre-definition demands coming from the DSO to the EVSE Operator. • An adequate communication capability should be endorsed in the EV in order to receive modulation orders from the DSO through the EVSE energy gateway, especially for low power and time consuming recharges (e.g. 3.3 kW). • The EVSEs are in communication with an EVSE Operator Backend that aggregates data from each EVSE. • The EVSEs Operator Backend aggregates data from each EVSE and is able to perform communication with the DSO or the marketplace where the dedicated service is running. • Service contracts should always declare performances from a nominal point view.		
Successful outcome	The EVSE achieves a load reduction to satisfy DSO request.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EV data cannot be retrieved.	There would be no chance to deliver such information to the stakeholders.	Data properties issues between OEM and EVSP
Primary actor	132: ACT EVSE Operator		
Secondary actors	129: ACT DSO Distribution System Operator		
Main scenario	• As soon as the network congestion is detected, the DSO front-end towards the electricity grid and the energy market (that together with the EVSE Op. back-ends defines the Infrastructure Management System (IMS) a multi-owners layer in the electric mobility framework) evaluates, aggregated per each EVSE Op. back-end of interest, the requested load profile allowed for EV recharging. • The DSO therefore forward the power profile request to the EVSE Op. back-ends that are in charge of distributing the electric-mobility load profile over the registered EVSEs, according to their own algorithm/contractual constraints. • Once the load reduction is elaborated and distributed in a granular way within all the EVSEs, the EVSE Op. back-end forward the load profile to the EVSEs that are currently in use in the specified load area where the DSO has detected the network congestion. • The updated load profile is forwarded to the EV, under the assumption that the EV is able to deal with this issue and the communication EV-EVSE guarantee this information to be propagated. Therefore the EV modifies its charging pattern and feeds back power profile to the EVSE that migrates it to the EVSE Operator back-end. • The EVSE Op. back-end finally aggregates the updated power profiles gathered from the EVSEs and makes available this update to the DSO as a fulfillment of its initial request.		
Alternatives	An EVSE could be implemented without the capability to communicate with an EVSE		

	operator backend. This would however implicate that it cannot interact with the DSO. In this case it would charge regardless of any DSO detections. This could be problematic when EV penetration into the market becomes higher.
Variations	The DSO may decide not to use the load reduction availability from the EVSEs because it is not significant or other reasons.
Related information	This use case shows the chance of reducing load profile which can be used to support the DSO in order to operate selectively. Instead of stopping the service, the EVSE could offer a limited service in order to accomplish the DSO's requirement.
Issues	Regulation and local legislation

5.3.3 973 FTR Reactive power

The injection of reactive power coming from a distributed generation unit (such as an EVSE) into the grid makes it possible to reduce the amount of reactive power on the distribution lines, re-phasing the mid voltage grid. A fundamental prerequisite for this feature to take place is that the regulatory framework allows that distributed generation units connected to the mid / low voltage grid inject power with a significant reactive content. In fact, nowadays, most regulators forbid injection of power under a Cos[Phi] of 0.9, which means embedded with an insignificant amount of reactive power.

An EVSP, acting as aggregator, offers reactive power from the aggregated flexible load under its control (similarly to other ancillary services) to the DSO. The DSO evaluates whether or not such an offer of aggregated power is valuable to increase the quality of service in a specific load area, by matching with the capability of bidirectional flow of energy of the EVSEs involved.

Such a feature obviously requires a communication layer to be established on top of the EVSEs between the EVSE Op. back-end, the EVSP back-end and the electric mobility marketplace, and an direct interaction between the EVSE Op. back-end and the DSO front-end in order to demand the bidirectional flow (this feature may be a special condition of V2G capability).

Provision of reactive power will reduce losses and the DSO will reward the EVSP based on savings it can reach by the reduction of losses.

5.3.3.1 1605 UC Reserve and activate ancillary services

Scope & Level	Value Added service. An EVSP offers aggregated flexible load as ancillary service to the DSO in order to help the DSO to fulfill the distribution rules established by the regulation framework in which it operates. In example, frequency and voltage will be adjusted in the local grid by drawing power from the batteries or interrupting load. This service will increase the quality of power in the grid and the DSO will reward the EVSP (aggregator) for provision of this service. Also, reducing the imbalance on phases on the LV substation is another example of use case of an ancillary service. Load switching from different phases will provide phase balancing to the grid that will reduce the losses on the distribution wires. Phase balancing will reduce losses in the distribution grid. DSO will reward the EVSP based on the savings it can reach by the reduction of losses. The injection of reactive power coming from a distributed generation unit (such as an EVSE) into the grid makes possible to reduce the amount of reactive power on the transmission lines, re-phasing the MV grid, and this is another example of ancillary service which may be enrolled here. All 973,974 and 975 features can be deployed

	through this single use case. Other examples of ancillary services are: • scheduling and dispatch • reactive power and voltage control • loss compensation • load following • system protection • energy imbalance		
Goal in context	An EVSP may offer, through a V2G capability to be established in the contracts with its partners, the possibility of helping the DSO in network safety and quality of service issues by offering a set of ancillary service, amongst which phase balancing and reactive power are the most significant ones.		
Preconditions	• Provisioning of ancillary services from an EVSP is guaranteed by the same requirements that have to be fulfilled to satisfy the specific conditions stated for example in Network Congestion Management and V2G capability features (i.e. EVSP back-end communicating with DSO front-end, smart recharge infrastructure, proper regulatory framework, etc.). A fundamental prerequisite for this feature to take place is that the regulatory framework allows that distributed generation units connected to the MT do inject power with a significant reactive content. In fact, nowadays, most of regulators forbid injection of power under a Cos[Phi] of 0.9, which means embedded with an insignificant amount of reactive power. • A communication layer is required to be established on top of the EVSEs between the EVSE Op. back-end, the EVSP back-end and the electric mobility marketplace, and an direct interaction between the EVSE Op. back-end and the DSO front-end in order to demand the bidirectional flow (this feature may be a special condition of V2G capability). • Other services, including phase balancing, have similar requirements to the Reactive Power provisioning from an EVSP. • A communication layer has to be established on top of the EVSEs between the EVSE Op. back-end, the EVSP back-end and the electric mobility marketplace, and a direct interaction between the EVSE Op. back-end and the DSO front-end in order to demand the bidirectional flow (this feature may be a special condition of V2G capability).		
Successful outcome	The EVSP succeeds in provisioning ancillary services to the DSO by dealing with its specific network safety and quality of service related needs.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EV and EVSE cannot communicate the reverse flow of energy condition.	There would be no chance to feed back energy into the grid.	Lack of communication or lack of compliancy to ISO15118 where EV-EVSE communication is available.
	EVSP cannot use EV for V2G.	The EV User does not allow to feed energy from his EV to the grid	Absence of V2G condition in the contract.
	EVSP release V2G without safety check.	The EVSP force EVs to feed energy back into the LV grid.	Lack of regulation for V2G
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	132: ACT EVSE Operator 129: ACT DSO Distribution System Operator		

Main scenario	When V2G is allowed and technically supported, the EV may act as a prosumer controlled by EVSPs that use the EVSE energy gateway in order to deliver network safety and quality of service benefits to the DSO. • An EVSP, acting as aggregator, offers reactive power from the aggregated flexible load under its control (similarly to other ancillary services) to the DSO. • The DSO evaluates whether or not such an offer of aggregated power is valuable to increase the quality of service in a specific load area, by matching with the capability of bidirectional flow of energy of the EVSEs involved.
Alternatives	The EVSP may not be directly linked to the DSO front-end but simply publish its offerings into a dedicated service on the marketplace, that can be eventually accessed from the DSO through its front-end, after having filtered information according to load-area and pricing criteria.
Variations	Future releases may extend to the TSO level (Transmission Systems Operator)
Related information	This use case shows the chance of using energy stored in the EVs as a prosumer platform for energy to be eventually fed into the LV grid. It is hereby pictured how ancillary services may be managed by the different actors in the marketplace.
Issues	Regulation

5.3.3.2 1604 UC Vehicle to grid signal

This Use Case is listed before in this Chapter, please refer to paragraph5.3.2.1

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need for congestion management to multiple service providers through the marketplace.

5.3.4 974 FTR Phase balancing

EVSP offers aggregated flexible load to the DSO to be used to reduce the imbalance on phases on the LV substation. Load switching from different phases will provide phase balancing to the grid that will reduce the losses on the distribution wires.

Phase balancing will reduce losses in the distribution grid. DSO will reward the EVSP based on the savings it can reach by the reduction of losses. This feature has similar requirements to the Reactive Power provisioning from an EVSP.

The DSO evaluates whether or not such an offer of aggregated power is valuable to increase the quality of service in a specific load area, by matching with the capability of bidirectional flow of energy of the EVSEs involved. Such a feature obviously requires a communication layer to be established on top of the EVSEs between the EVSE Op. back-end, the EVSP back-end and the electric mobility marketplace, and an direct interaction between the EVSE Op. back-end and the DSO front-end in order to demand the bidirectional flow (this feature may be a special condition of V2G capability)

5.3.4.1 1605 UC Reserve and activate ancillary services

This Use Case is listed before in this Chapter, please refer to paragraph5.3.3.1

Scope & Level	Value Added service. Scenario E2. An EVSP offers aggregated flexible load as ancillary service to the DSO in order to help the DSO to fulfill the distribution rules established by the regulation framework in which it operates. In example, frequency and voltage will be adjusted in the local grid by drawing power from the batteries or interrupting load. This service will increase the quality of power in the grid and the DSO will reward the EVSP (aggregator) for provision of this service. Also, reducing the imbalance on phases on the LV substation is another example of use case of an ancillary service. Load switching from different phases will provide phase balancing to the grid that will reduce the losses on the distribution wires. Phase balancing will reduce losses in the distribution grid. DSO will reward the EVSP based on the savings it can reach by the reduction of losses. The injection of reactive power coming from a distributed generation unit (such as an EVSE) into the grid makes possible to reduce the amount of reactive power on the transmission lines, re-phasing the MT grid, and this is another example of ancillary service which may be enrolled here. All 973,974 and 975 features can be deployed through this single use case. Other examples of ancillary services are: • scheduling and dispatch • reactive power and voltage control • loss compensation • load following • system protection • energy imbalance

5.3.4.2 1604 UC Vehicle to grid signal

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.2.1

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need for congestion management to multiple service providers through the marketplace.

5.3.5 975 FTR Ancillary services

An EVSP offers aggregated flexible load as ancillary service to the DSO in order to help the DSO to fulfill the distribution rules established by the regulation framework in which it operates. In example, frequency and voltage will be adjusted in the local grid by drawing power from the batteries or increasing or decreasing power load. This service will increase the quality of power in the grid and the DSO will reward the EVSP (aggregator) for provision of this service.

Other examples of ancillary services are:

- scheduling and dispatch
- reactive power and voltage control
- loss compensation

- load following
- system protection
- energy imbalance

Provisioning of ancillary services from an EVSP is guaranteed by the same requirements that have to be fulfilled to satisfy the specific conditions stated for example in Network Congestion Management and V2G capability features (i.e. EVSP back-end communicating with DSO front-end, smart recharge infrastructure, proper regulatory framework, etc.).

5.3.5.1 1605 UC Reserve and activate ancillary services

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.3.1

Scope & Level	Value Added service. Scenario E2. An EVSP offers aggregated flexible load as ancillary service to the DSO in order to help the DSO to fulfill the distribution rules established by the regulation framework in which it operates. In example, frequency and voltage will be adjusted in the local grid by drawing power from the batteries or interrupting load. This service will increase the quality of power in the grid and the DSO will reward the EVSP (aggregator) for provision of this service. Also, reducing the imbalance on phases on the LV substation is another example of use case of an ancillary service. Load switching from different phases will provide phase balancing to the grid that will reduce the losses on the distribution wires. Phase balancing will reduce losses in the distribution grid. DSO will reward the EVSP based on the savings it can reach by the reduction of losses. The injection of reactive power coming from a distributed generation unit (such as an EVSE) into the grid makes possible to reduce the amount of reactive power on the transmission lines, re-phasing the MT grid, and this is another example of ancillary service which may be enrolled here. All 973,974 and 975 features can be deployed through this single use case. Other examples of ancillary services are: • scheduling and dispatch • reactive power and voltage control • loss compensation • load following • system protection • energy imbalance

5.3.5.2 1604 UC Vehicle to grid signal

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.2.1

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need for congestion management to multiple service providers through the marketplace.

5.3.6 971 FTR Aggregated balancing capacity

An EVSP, acting as aggregator in the energy market, will be able to offer energy from the batteries of the EVs used by its customers that are connected to the recharging infrastructure in a certain timeslot. Obviously, the customer acceptance is required and V2G availability must be stated in the contract between the EVSP and its customer and there shall also be a B2B pre-agreement between the EVSP and the energy buyers. Generally speaking, an EVSP while acting as aggregator sees energy vendors as final customers, due to the possibility of offering in the energy market a certain amount of energy retrieved from the EVs. This activity will be constrained by regulatory framework in each country.

Where the energy market is run according to an unbundling rule, the selling of energy from EVs will be exclusively towards energy vendors. Otherwise, if the regulatory framework does not foresee constraints for selling and buying energy, the EVSP could also offer the energy itself to either the Distribution System Operator (DSO) or Transmission System Operator (TSO) as a balancing service for its grid, or to Energy Suppliers to manage their Energy Balance.

The recharging infrastructure is connected to the LV grid, and any load variation on the recharging infrastructure will impact the LV grid; the DSO is responsible for the quality and safety of this LV grid, and is therefore always involved in any EV related load management, including V2G. The TSO´s responsibility is not affected as long as the V2G load variations stay below a certain threshold. Thus V2G can pragmatically achieve a small scale penetration in the electricity market by offering limited amounts of power to DSO´s only.

To be able to offer V2G balancing capacity to the market (Energy Suppliers, in future also TSO), the following additional mechanisms must be in place:

- To manage the LV grid, the DSO will retrieve all relevant status and charging information of the recharging infrastructure from the EVSE Operators. This includes the infrastructure's generic V2G capabilities and the available V2G power for specific time slots (vehicle connection windows)
- When an EVSP wants to provide V2G energy, he will offer an amount of kWh based on the status of his connected V2G capable EV´s, and specify this to the relevant DSO's.
- The DSO's match the EVSP´s kWh offering with the connection data from the EVSE Operator, to determine where and how the EVSP´s power offering will enter each DSO's LV Grid.
- Each DSO considers (the relevant part of) the offering, taking into account Network quality, safety and historical load profile analysis. The DSO then decides to allow or deny this part of the EVSP's energy offering onto the market.
- Once the (partial) offerings are allowed onto the market, the potential buyer (Energy supplier, in future also TSO) may decide whether or not to use the EVSP provided balancing service. The buyer will base his decision on the aggregation of offerings over different load areas under responsibility of different DSO's.

Use cases that realize this Feature are also illustrated in Appendix B, for more please refer to

- 1186 BPD Centralized Congestion Management
- 1198 BPD Congestion Management through TOU Tariffs
- 1199 BPD Distributed Congestion Management

5.3.6.1 1604 UC Vehicle to grid signal

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.2.1

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need

	for congestion management to multiple service providers through the marketplace.

5.3.6.2 1601 UC provide balancing capacity

Scope & Level	Value added service. An EVSP, acting as aggregator in the energy market, will be able to offer energy from the batteries of the EVs used by its customers that are connected to the re-charging infrastructure in a certain timeslot.		
Goal in context	This service may be published from an EVSP on the marketplace and provided to DSO / TSO or energy vendors, according to the regulatory framework. That is, In case of balancing services, the energy will be bought by the system operator. But if the EVSP is acting as an aggregator will participate in the different energy markets as any generator unit: for selling energy, and for offering ancillary services. Therefore, the unbundling precondition is true only in the energy market, but not in the ancillary services market.		
Preconditions	• The customer acceptance is required and V2G availability must be stated in the contract between the EVSP and its customer and there shall also be a B2B. • The EVSE Op. is connected to the marketplace through its back-end. • The EVSP is connected to the marketplace through its back-end. • The DSO is connected to the marketplace through its front-end towards the grid. • The EVSP states in its contracts with the customers that the average time of recharge is sensitive to the network safety issues (peaks management from the DSO) and eventually to charging points priority issues (coming from the deployment strategy of the EVSE Operator). • A smart recharging infrastructure is needed in order to accomplish peak predefinition demands coming from the DSO to the EVSE Op. • An adequate communication capability should be endorsed in the EV in order to receive modulation orders from the DSO through the EVSE energy gateway, especially for low power and time consuming recharges (e.g. 3.3 kW). • The EVSEs are in communication with an EVSE Op. back-end that aggregates data from each EVSEs. • The EVSEs Operator back-end aggregates data from each EVSEs and is able to perform communication with the DSO or the marketplace where the dedicated service is running.		
Successful outcome			
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSP cannot use EV for V2G.	The EV driver does not allow feed energy from his EV to the grid.	Absence of V2G condition in the contract.
	EV data cannot be retrieved.	There would be no chance to deliver such information to the stakeholders.	Data properties issues between OEM and EVSP.
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	132: ACT EVSE Operator		

	129: ACT DSO Distribution System Operator 130: ACT Energy Retailer
Main scenario	• The EVSP collects and aggregates relevant information regarding the V2G from each connected EVSE Op. Also, information may be accessed through EVSP that make it available. This does not mean that information is published twice, but underlines that different actors (EVSP and EVSE Op.) may have the right of delivering it, according to the regulatory framework. • Information about power injection availability over the LV grid is passed from the EVSP to the DSO. • The DSO matches this data with data from the EVSE operator in order to identify where the available power is located in the LV grid The DSO allows (or denies) the EVSP's energy offering inside its load area. • The potential buyer (Energy supplier, in future also TSO) can then decide if it wants to use the balancing service from the EVSP. This may include aggregating the offerings from several DSOs
Alternatives	Penalties may apply for EVSP's which fail to deliver on their peak load commitments towards the DSO or the balancing responsible party. Incentives may be provided on the energy bill for (end) customers providing potential balancing power (regardless of it being used).
Variations	EVSPs might not be able to directly sell energy. In this case, the DSO would buy a service from EVSPs and resell energy.
Related information	This use case exploits the possibility of using V2G capability in order to aggregate energy and provide balancing to other energy actors, e.g. DSO or TSO/Energy Vendor.
Issues	

5.3.7 965 FTR Peak shaving on MV

Under the assumption that network congestion management and V2G energy supply signal features hypothesis are satisfied, an advanced solution for dealing with congestion issues would be using the V2G availability published from the EVSPs in order to simultaneously impact positively with a dynamic energy disposal on the grid by sharpening the load peaks in an adaptive way.

It is the DSO that decides whether or not to deploy such a congestion management policy, after having evaluated the energy availability aggregated per load area from the various EVSPs in order to ensure that switching an amount of cars into V2G can surely trigger peak shaving.

The goal of peak shaving using V2G capability is to guarantee the energy provisioning to all the loads connected to the grid without deploying cut-off load management strategies under a congestion situation, thus letting the DSO to re-route the surplus of power gathered from EVSPs.

DSO will aim to reduce peaks on the MV level by using aggregated V2G on LV substations and re routing power through uncongested areas.

5.3.7.1 1597 UC Peak shaving

NOTE: this is a stand-alone use case and needs 1601 and 1602 use cases as pre-conditions.

Scope & Level	Value added service.

	If network congestion management and V2G energy supply signal hypothesis are satisfied, an advanced solution for dealing with congestion issues would be using the V2G availability published from the EVSPs in order to simultaneously impact positively with a dynamic energy disposal on the grid by sharpening the load peaks in an adaptive way.		
Goal in context	This use case enables peak shaving by aggregated EVs (V2G deployed for grid congestion management). The goal of peak shaving using V2G capability is to guarantee the energy provisioning to all the loads connected to the grid without deploying cut-off load management strategies under a congestion situation, thus letting the DSO to re-route the surplus of power gathered from EVSPs.		
Preconditions	• The EVSE Op. is connected to the marketplace through its back-end. • The EVSP is connected to the marketplace through its back-end. • The DSO is connected to the marketplace through its front-end towards the grid. • An adequate communication capability should be endorsed in the EV in order to receive modulation orders from the DSO through the EVSE energy gateway. • The energy going in the reverse flow has to be metered in the EVSE energy gateway. • The EVSEs are in communication with an EVSE Op. back-end that aggregates data from each EVSEs. • The EVSP aggregates data from the EVs under its contractual control and is able to perform communication either directly with the DSO or the marketplace where the dedicated service is running. • All the other preconditions of UC 1601 and 1602.		
Successful outcome	DSO reduces peaks on the MV level by using aggregated V2G on LV substations and rerouting power through uncongested areas.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	No V2G power available	Absence of V2G condition in the contract.	The EV User does not allow V2G
	No V2G power available	There would be no chance to feed back energy into the grid. Lack of communication or lack of compliancy to ISO15118 where EV-EVSE communication is available.	EV and EVSE cannot communicate the reverse flow of energy condition.
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	132: ACT EVSE Operator 129: ACT DSO Distribution System Operator		
Main scenario	The EVSP is acting as aggregator and delivers energy from the EVs of its customers to the grid as a support for congestion management. It is the DSO that decides whether or not to deploy such a congestion management policy, after having evaluated the energy availability aggregated per load area from the various EVSPs in order to ensure that switching an amount of cars into V2G can surely trigger peak shaving		
Alternatives	The EVSE without communication capabilities towards an EVSE Op. back-end could not interact with the DSO peak predefinitions. In that case, the EVSE will not act as a bidirectional energy gateway towards the grid. Also, the condition of having an EV without ISO 15118 V2G compliant communication leads to the same alternative.		

Variations	The DSO may decide not to use the energy availability published from the EVSP because it is not profitable, or other reasons. The EVSP can also delete its offering.
Related information	This use case shows the chance of using an aggregated high - level service (e.g. the amount of EV drivers belonging to an EVSP currently connected and charging) matched with others (location of E V s charging per load area, network congestion management, V2G energy supply signal) in order to make use of V2G capability as a tool for network congestion management in a proactive way, by deploying peak shaving.
Issues	-

5.3.8 1317 FTR Peak shaving on LV

DSO uses aggregator service to bid peak shaving demand on particular substations through the marketplace. Alternatively DSO can approach the aggregator directly.

5.3.8.1 1597 UC Peak shaving

This Use Case is listed before in this Chapter, please refer to paragraph5.3.7.1

Scope & Level	Value added service. If network congestion management and V2G energy supply signal hypothesis are satisfied, an advanced solution for dealing with congestion issues would be using the V2G availability published from the EVSPs in order to simultaneously impact positively with a dynamic energy disposal on the grid by sharpening the load peaks in an adaptive way.

5.3.9 1313 FTR Allow interrupting

DSO and EVSE are in a contractual relationship, which allows the DSO to send congestion signals to a particular EVSE operator in order to:

- interrupt charging
- reduce the throughput of the CP

5.3.9.1 1572 UC Reduce Charge Power by DSO

Scope & Level	DSO instructs EVSE Operator to reduce the electrical power drawn from the Grid.
Goal in context	DSO and EVSE are in a contractual relationship, which allows the DSO to send congestion signals to a particular EVSE operator in order to: • interrupt charging • reduce the throughput of the CP
Preconditions	• DSO aware about congestion in particular part of the grid (online observation / forecast) • Capability for DSO to communicate / send signal to dedicated (e.g. grouped by grid section) EVSE or EVSE operators (obligation to forward signal to EVSE) active in respective grid section

Successful outcome	• EVSE interrupts charging or reduces charging power (reaction of the EV on EVSE's request) • Prevention of congestion / blackout		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EV receives no signal	No Power Reduction	EVSE-operator doesn't forward signal
	No Action	No Power Reduction	EV does not react on signal
	EV receives no signal	No Power Reduction	Communication failure
Primary actor	131: ACT EVSE (Electric Vehicle Supply Equipment) 129: ACT DSO Distribution system operator 132: ACT EVSE Operator		
Secondary actors	143: ACT EV (Electric Vehicle)		
Main scenario	• DSO detects grid constraints and intervenes in order to ensure supply / to prevent serious overloads or even blackouts (only applicable in "case of emergency" (high priority) • Intervention directly: DSO sends signal to all affected EVSE		
Alternatives	Intervention indirectly: DSO sends signal with location information to all EVSE-operators acting in the affected area		
Variations	-		
Related information	-		
Issues	Costumer's acceptance Contradicting interests between retailers / e-mobility-providers and DSO's		

5.3.10 961 FTR DSO predefines peaks

Within the MV/LV energy distribution domain, the peak energy available per load area is one of the design parameters for the substations and grid reinforcements/maintenance. It is within the DSO responsibility to foresee or evaluate from historical analysis the expected peak energy statistics per hour and day/month, in order to minimize shortages of energy supplying and fulfilling quality of services rules set by each national authority.

According to the DSO analysis, a threshold is set at every LV location, which may have a wide variety of energy loads beneath. A smart recharging infrastructure is needed in order to accomplish peak modulation coming from the DSO because a fast and secure communication layer has to be established between the points of delivery and some sort of EVSE back-end which will be communicating either with the marketplace or with the DSO front-end directly.

Once the peaks are identified per load area, the DSO can update requests for curtailment on the marketplace, setting the constraints for energy provisioning in the load area in which the EVSEs are encompassed. It is up to the EVSE Operator to decide whether or not distribute this constraint within all the EVSEs installed in that area or eventually cut off just a few of them.

A fundamental condition for this feature to take place is that the EVSP states in its contracts with the customers that the average time of recharge is sensitive to the network safety issues (peaks management from the DSO) and eventually to charging points priority issues (coming from the deployment strategy of the EVSE Operator).

5.3.10.1 1597 UC Peak shaving

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.7.1

Scope & Level	Value added service. If network congestion management and V2G energy supply signal hypothesis are satisfied, an advanced solution for dealing with congestion issues would be using the V2G availability published from the EVSPs in order to simultaneously impact positively with a dynamic energy disposal on the grid by sharpening the load peaks in an adaptive way.

5.3.10.2 1596 UC Peak load threshold on a substation

Scope & Level	Value added service. Within the MV/LV energy distribution management domain, the peak energy disposal per load area is one of the fundamental design parameters for the substations and grid reinforcements/maintenance.		
Goal in context	DSO defines thresholds peaks on each substation. It is within the DSO responsibility to foresee or evaluate from historical analysis the expected peak energy statistics per hour and/or day/month, in order to minimize shortages of energy supplying and fulfilling quality of services rules set by each national regulatory framework.		
Preconditions	• The EVSE Op. is connected to the marketplace through its back-end. • The EVSP is connected to the marketplace through its back-end. • The DSO is connected to the marketplace through its front-end towards the grid. • The EVSP states in its contracts with the customers that the average time of recharge is sensitive to the network safety issues (peaks management from the DSO) and eventually to charging points priority issues (coming from the deployment strategy of the EVSE Operator). • A smart recharging infrastructure is needed in order to accomplish peak predefinition demands coming from the DSO to the EVSE Op. • An adequate communication capability should be endorsed in the EV in order to receive modulation orders from the DSO through the EVSE energy gateway, especially for low power and time consuming recharges (e.g. 3.3 kW). • The EVSEs are in communication with an EVSE Op. back-end that aggregates data from each EVSEs. • The EVSEs Op. back-end aggregates data from each EVSEs and is able to perform communication with the DSO or the marketplace where the dedicated service is running.		
Successful outcome	The EVSE is in communication with the DSO (either directly if the DSO is the EVSE Operator or indirectly if the EVSE Operator is another actor and therefore the DSO front-end is not owned by the same actor of the EVSE Op. back-end) and receives periodic updates on peaks disposal.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSE cannot accept predefined peaks.	The EV will recharge regardless of the forecasts done by the DSO on network safety and quality of service.	• The EVSE is not endorsed with communication capabilities. • The EVSE is installed but not connected to its back-

			end and, through that, made available as a manageable point of delivery for the DSO network safety and quality of service issues.
	EVSP provides a nominal service to its customers	The EV will recharge regardless of the forecasts done by the DSO on network safety and quality of service.	• The EVSP is forced to guarantee recharge time as stated in the contract for a pre-settled energy disposal at the EVSE. • The EVSP contract does not foresee network safety and EVSE Op. priority issues over EVSEs as constraints for service provisioning.
Primary actor	132: ACT EVSE Operator		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 129: ACT DSO Distribution system operator		
Main scenario	According to the DSO analysis, a threshold is set at every LV location, which may have a wide variety of energy loads beneath. Once the peaks are identified per load area, the DSO can update requests for curtailment on the marketplace, setting the constraints for energy provisioning in the load area in which the EVSEs are encompassed. It is up to the EVSE Operator to decide whether or not to distribute this constraint within all the EVSEs installed in that area or eventually cut off just a few of them. When the customer approaches the EVSE, he is well aware that time of recharge will be due to network safety and EVSE Op. priorities over peak disposal within its installed EVSEs in that area.		
Alternatives	The EVSE without communication capabilities towards an EVSE Op. back-end could not interact with the DSO peak predefinitions. In that case, the EVSE will continue its dumb charging regardless any forecast / historical analysis and hazards would eventually emerge for higher EV penetration in the market.		
Variations	The EVSE could eventually decide not to load the EV if the peak predefined is unreliable for a timely recharge. The EV could do the same as well.		
Related information	This use case refers to making EVs as a possible tool for managing the LV grid in a safe and reliable way, through a communication layer and a smart recharging infrastructure, avoiding network reinforcements and eventually leading to sustaining higher volumes of renewables production towards EU 202020 targets.		
Issues	-		

5.3.11 966 FTR Current EV charge

The overview of current EV charge is meaningful information that an EVSP, acting as Service Provider in the marketplace, can use in order to deliver benefits to its customers and sell or support services for others business actors in the electric mobility market. A requirement for this use case to take place is that there is a specific field which describes the status of charge, embedded within the communication data exchanged between EV and EVSE (ISO15118 currently under development is compliant with this hypothesis). In order to deliver this information from the real time charging process to the marketplace and

make it available for other actors (service requestors) it is also needed that the status of charge is propagated from the EVSE to the EVSE Operator back-end / EVSP back-end system. Hence it is eventually elaborated (i.e. threshold-triggered aggregation of a relevant number of status charge details per area) and thus propagated to the marketplace by updating the content of the service placed there.

Other actors in the market may act as Service Requestors and access the Current EV charge information made available from a specific EVSP and match this with their needs. For example, this service could be used from a TSO or an Energy Vendor (according to the regulatory framework) in order to monitor the power eventually available, after the network safety and quality preconditioning made by the DSO. This service could also be used for marketing purposes by OEMs in order to retrieve charging behavior of the average customer, i.e. meaningful information could be that most of the people may unplug their vehicle once it reaches 50% recharge.

5.3.11.1 1524 UC Fleet manager monitors energy consumption of pool-cars

This Use Case is listed before in Chapter 3Driving and cross domain use case model, please refer to paragraph 3.4.3.5

Scope & Level	Value Added Service. Monitoring of energy consumption for single cars or the whole fleet.

5.3.11.2 1598 UC Aggregated EV charge overview by the DSO

Scope & Level	Value added service. The overview of current EV charge is meaningful information that an EVSP, acting as Service Provider in the marketplace, can use in order to deliver benefits to its customers and sell or support services for others business actors in the electric mobility market.		
Goal in context	This use case creates and distributes through Marketplace the aggregated current charging information of EVs in the area of a DSO. The service could be used by a Service Requestor such as the TSO or an Energy Vendor (according to the regulatory framework) to monitor the power eventually available, after the network safety and quality preconditioning made by the DSO. This service could also be used for marketing purposes by OEMs in order to influence charging behavior of the average customer (e.g. people may unplug their vehicle once it reaches 50% recharge).		
Preconditions	• The status of charge is available within the communication data exchanged between EV and EVSE (ISO15118 currently under development is compliant with this hypothesis). • The EVSE Operator is connected to the marketplace through its back-end. • The EVSP is connected to the marketplace through its back-end. • EV manufacturers allow for this information to be delivered to the other stakeholders.		
Successful outcome	The stakeholders accesses to the current EV charge data which are collected by EVSP		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EV and EVSE cannot communicate the status of re-	There would be no chance to deliver such information to the stake-	Lack of communication or lack of compliancy to ISO15118 where EV-EVSE communica-

	charge.	holders.	tion is available.
Primary actor	128: ACT EVSP (Electric Vehicle Service Provider)		
Secondary actors	129: ACT DSO Distribution system operator 132: EVSE Operator 138: ACT Service Requester (TSO, OEM or Energy Supplier)		
Main scenario	The EVs communicate the current EV charge status to the EVSE back-end. The status of charge is propagated from the EVSE to the EVSE Operator back-end / EVSP back-end system. The EVSP collects the current EV charge data from all the connected EVSEs. The data are stored in a local DB and after a specific aggregation procedure they are available to the marketplace through the EVSP front-end.		
Alternatives	Other actors in the market may act as Service Requestors and access the Current EV charge information made available from a specific EVSP and match this with their needs.		
Variations	The EVSE could eventually decide not to load the current EV charge data is unreliable for a timely recharge. The EV could do the same as well.		
Related information	This use case shows the chance of having current EV charge data which can be used to supply real-time services or to accomplish marketing purposes.		
Issues	-		

5.3.12 1202 FTR V2G energy supply signal

An EVSP, acting as aggregator in the energy market, will be able to offer energy from the batteries of the EVs used by its customers that are connected to the recharging infrastructure in a certain timeslot. Obviously, the customer acceptance is required and a V2G availability must be stated in the contract between the EVSP and its customer and there shall also be a B2B pre-agreement between the EVSP and the energy buyers. Generally speaking, an EVSP while acting as aggregator sees energy vendors as final customers, due to the possibility of offering in the energy market a certain amount of energy retrieved from the EVs. This activity will be constrained by regulatory framework in each country.

Where the energy market is run according to an unbundling rule, the selling of energy from EVs will be exclusively towards energy vendors. Otherwise, if the regulatory framework does not foresee constraints for selling and buying energy, the EVSP could also offer the energy itself to either the Distribution System Operator (DSO) or Transmission System Operator (TSO) as a balancing service for its grid. From a general point of view, the recharging infrastructure is connected to the LV electricity grid. Thus, each condition that varies the load impacts over the quality and safety of LV grid, which is within the responsibility of the DSO. As far as the availability of energy that can be retrieved by EVSP customers is below a certain quantity, the V2G activity should not reasonably affect the TSO. So it is within the DSO duties do release a signal to the EVSP by stating that under a specified load area the cars connected to the EVSEs are allowed to feed back into the grid a pre-settled amount of energy. This can be accomplished if the DSO smart management layer (IMS) is somehow connected to the EVSP back-end and is able to retrieve and provide information.

5.3.12.1 1604 UC Vehicle to grid signal

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.2.1

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need

	for congestion management to multiple service providers through the marketplace.

5.3.13 560 FTR V2H supply signal

The DSO sends a signal to the EV to release energy to the household.

5.3.13.1 1604 UC Vehicle to grid signal

This Use Case is listed before in this Chapter, please refer to paragraph 5.3.2.1

Scope & Level	Value added service. This use case enables the DSO or other energy stakeholders to distribute the need for congestion management to multiple service providers through the marketplace.

5.3.14 967 FTR History of EVSE use

The historical use of EVSEs is a sensible information that an EVSE Operator, acting as Service Provider in the marketplace, can use in order to deliver benefits to its customers and sell or support services for others business actors in the electric mobility market.
EVSE History must contain:

- time stamp;
- EVSP ID (implicit for single-EVSP EVSE's)
- geographical / load area;
- energy consumed;
- quality of service (i.e. out of service, outage,...);
- charging status;
- failed authorization attempts;
- V2G historical use;

Such a feature requires that the EVSE is able to deal with charging information, so the recharging infrastructure is expected to be a smart one with embedded communication capabilities. Also, B2B relationships between EVSP and EVSE Op. must guarantee access to part of the information enrolled above, i.e. the charging status.

This information can be aggregated either per EVSE or per geographical/load area from the EVSE Op. back-end and made available as content for a dedicated service to be run in the marketplace. Therefore, it is the EVSE Op. who acts as Service Providers and care about the aggregation and migration of data by updating the content of the service.

This service can be requested from other actors in the marketplace for different purposes, i.e. for statistical analysis on EVs roll-out, EVSE performance analysis, EVSE Op. marketing and certification.

5.3.14.1 1599 UC History of EVSE use

Scope & Level	Value added service. The historical use of EVSEs is useful information that an EVSE Operator, acting as Service Provider in the marketplace, can use in order to deliver benefits to its cus-

	tomers and sell or support services for others business actors in the electric mobility market.		
Goal in context	This use case enables gathering of charging detail by the DSO and making this information accessible through the marketplace.		
Preconditions	• This requires that the EVSE is able to deal with charging information, so the recharging infrastructure is expected to be smart, with embedded communication capabilities. • Also, B2B relationships between EVSP and EVSE Operator must guarantee access to part of the information enrolled above, e.g. the charging status.		
Successful outcome	Stakeholders can retrieve EVSE History Information		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	EV data cannot be retrieved.	EV data can't be delivered to stakeholders	Data properties issues between OEM and EVSP.
Primary actor	32: ACT EVSE Operator		
Secondary actors	128: ACT EVSP (Electric Vehicle Service Provider) 1406: ACT ECSE Operator Backend		
Main scenario	• The historical use of EVSEs can be aggregated either per EVSE or per geographical/load area from the EVSE Operator back-end • This information should be made available as content for a dedicated service to be run in the marketplace. • Therefore, it is the EVSE Operator who acts as Service Provider and takes care of the aggregation and migration of data		
Alternatives	This service can be requested from other actors in the marketplace for different purposes, i.e. for statistical analysis on EVs roll-out, EVSE performance analysis, EVSE Operator marketing and certification.		
Variations	-		
Related information	EVSE History must contain: • time stamp; • EVSP ID (implicit for single-EVSP EVSE's) • geographical / load area; • energy consumed; • quality of service (i.e. out of service, outage,...); • charging status; • failed authorization attempts; • V2G historical use;		
Issues	-		

6 Core marketplace services use case model

6.1 Overview

The core marketplace services domain represents the essential services to run the marketplace itself. It covers mainly the functionality to offer services by service providers and the use of those services by service requester, referring typically to the terms "Buying" and "Selling". These terms are processes, which can be divided in sub processes, as shown in the following figure.

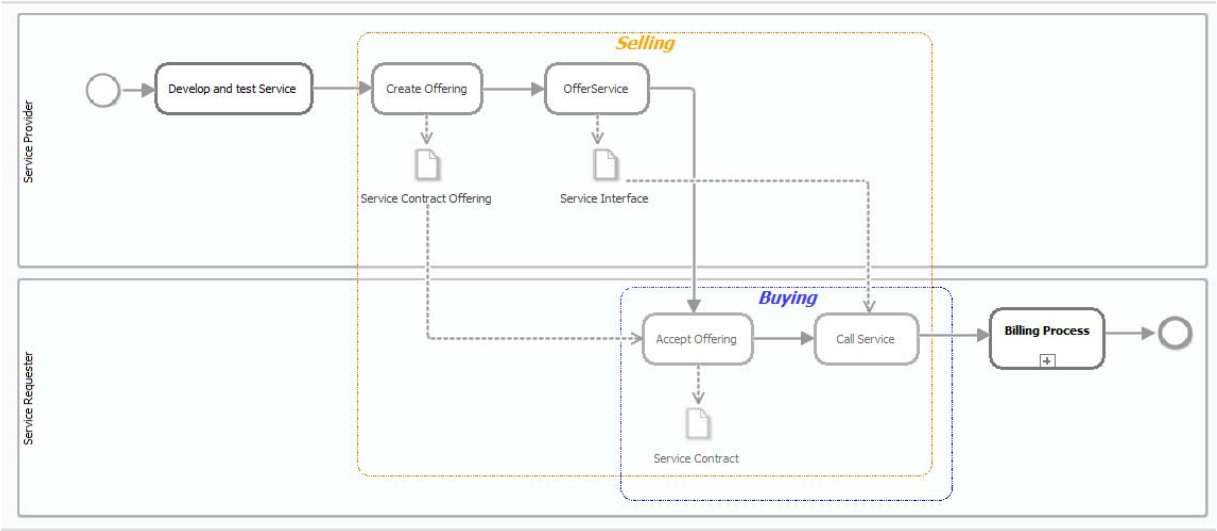


Figure 19 Marketplace "Buying" and "Selling"

Most of these sub processes are covered by the contract management functional component, except for the call of services. The call of services is based upon the marketplace's functionality of routing the service call of a service requester to the corresponding service provider. In addition the marketplace is able to aggregate the results of different service providers.

Additionally, the core marketplace services provide functionality to support the "Selling" and "Buying" processes. The following figure shows the main functional components of the core marketplace services based upon the business scenarios defined in the Deliverable 3.1 "GeM_D3.1_BusinessAnalysis_V1.4_FINAL_WP3".

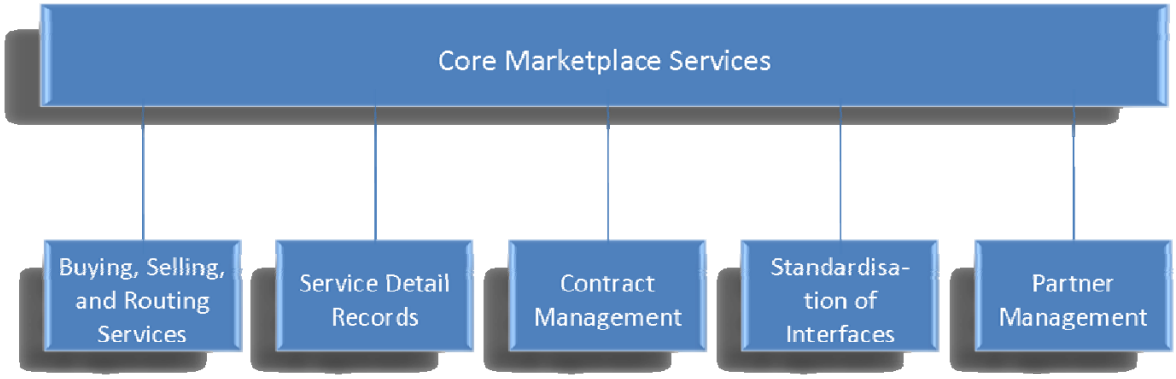


Figure 20 Structure of the Marketplace Domain

In addition, the marketplace offers the ability to record details of the service calls for use in accounting and billing. Among the creation of service contracts between business partners, the contract management component provides functionality for changing and terminating service contracts. A further functional component handles the standardization of interfaces. This allows providing similar value added services by different service providers. The results of the service calls can be aggregated by the marketplace to return one single result to the service requester. The last functional component, partner management, covers the registration of a business partner as well as changing his data or activating/inactivating the business partner.

As a result of the Usability workshops, the methodology of which is described earlier in this deliverable [see Introduction] the following Task case map was created by the workshop participants. This approach is used in the GeM project to validate the requirements/features documented in the RCC Tool.

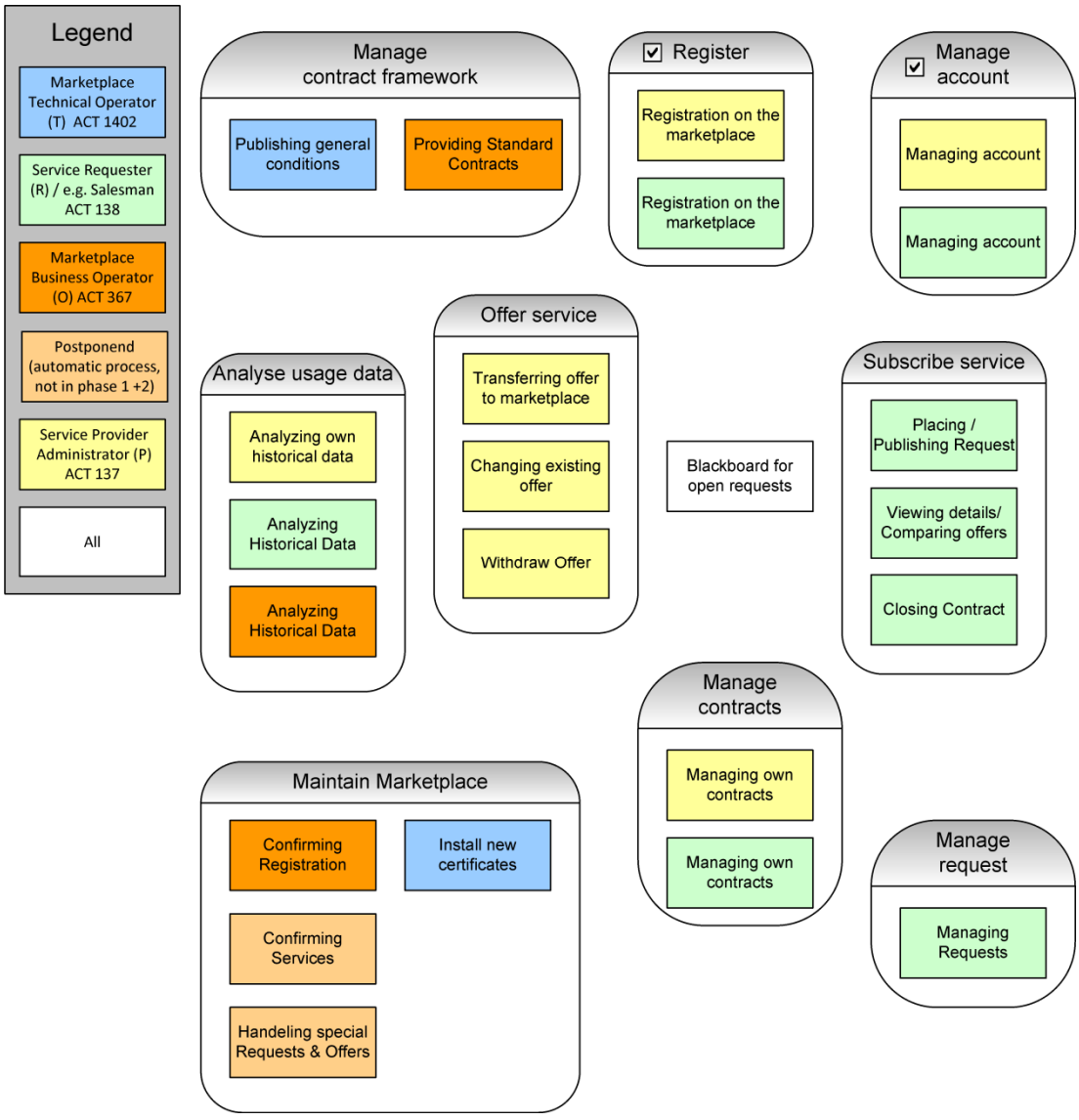


Figure 21 Task Cases for Core Marketplace Services

6.2 Actors

The actors in the core marketplace services are part of a hierarchy as shown in the following figure.

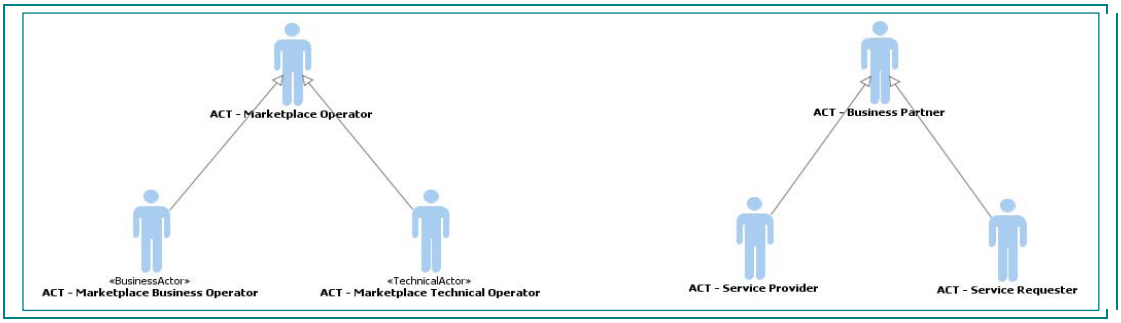


Figure 22 Hierarchy of Actors in Core Marketplace Services

The identified actors and their descriptions are listed in the following table.

ID	Actor	Description
1355	ACT Business Partner	Abstract actor representing the service provider as well as the service requester
1367	ACT Marketplace Business Operator	A special kind of the Marketplace Operator role
136	ACT Marketplace Operator	Operates the platform and communications, and manages access to and working of the marketplace
1402	ACT Marketplace Technical Operator	A special kind of the Marketplace Operator role
137	ACT Service Provider	Business Partner that offers and sells EV Services on the marketplace
138	ACT Service Requester	Business Partner that consumes EV Services on the Marketplace

Table 6.13 Core Marketplace Services - Actors

The interactions between the Actors in this chapter are for most of the scenarios illustrated in Appendix B, for more information please refer to the business process diagrams:
1456 BPD Use of Services1431 BPD Contracting Service
1495 BPD Service Detail Records for Accounting and Billing
1410 BPD Define and Register Service Contract Offering
1426 BPD Change or terminate a Service Contract
1427 BPD Prolong Service Contract
1428 BPD Enable/Disable Service permanently
1387 BPD Service Registration
1429 BPD Delete Service
1271 BPD Propose Standard Interface
1363 BPD B2B Partner Management - Create Business Partner Account
1371 BPD B2B Partner Management - Change Business Partner Account
1382 BPD B2B Partner Management - Activate Business Partner Account
1403 BPD B2B Partner Management - Inactivate Business Partner Account

6.3 Features and Use Cases

6.3.1 Overview

The following table lists the Marketplace Features and their Use Cases.

ID	Feature	Realized By
1617	FTR Marketplace - Authentication and Authorization	1619 UC Marketplace - Logout 1618 UC Marketplace - Login
924	FTR Search and Select Service	1239 UC Search and Select Services 1484 UC View Service Details
1447	FTR Contracting Service	1485 UC Create Service Contract 1487 UC Download Service Specification 1239 UC Search and Select Services 1484 UC View Service Details 1478 UC Download Service Content
926	FTR Call of Service	1491 UC Create Service Transaction 1241 UC Call of Service 1245 UC Search and Select Service Contracts
1459	FTR Aggregate Service Call Results	1492 UC Aggregate Service Call Results
1685	FTR Create Notification to Service Requester	1687 UC Notify Service Requesters of own Service
1622	FTR Manage Requests for new Services	1625 UC Create Request for a new Service 1623 UC View Details of Requests of new Services 1629 UC Create Response on Requests for new Services 1620 UC Search and Select Requests for new Services 1626 UC Change Request for a new Service 1627 UC Delete Request for a new Service
927	FTR Service Transaction overview	1239 UC Search and Select Services 1471 UC View Service Transaction Details 1242 UC Search and Select Service Transactions
935	FTR Provide Service Contract Framework	1482 UC View Service Contract Template
1396	FTR Define and Register Service Contract	1485 UC Create Service Contract 1482 UC View Service Contract Template 1624 UC Change Service Contract Offering 1479 UC View Service Contract Details 1470 UC Create Service Contract Offering 1484 UC View Service Details
931	FTR Change or Terminate Service Contract	1480 UC Create Service Contract Termination Request 1481 UC Confirm Service Contract Termination 1479 UC View Service Contract Details 1245 UC Search and Select Service Contracts 1247 UC Confirm Service Contract Change 1246 UC Create Service Contract Change Request
1469	FTR Suspend/Resume Service Contract	1479 UC View Service Contract Details 1245 UC Search and Select Service Contracts 1490 UC Suspend/Resume Service Contract by Service Requester

ID	Feature	Realized By
1315	FTR Register Service	1477 UC Create Service Registration Contract 1482 UC View Service Contract Template 1494 UC Publish Service 1489 UC Upload Service Specification 1470 UC Create Service Contract Offering 1488 UC Upload Service Content 1250 UC Register Service 1476 UC View Standard Interface Details 1475 UC Search and Select Standard Interface
1443	FTR Enable / Disable Service	1255 UC Start/Stop Service 1480 UC Create Service Contract Termination Request 1687 UC Notify Service Requesters of own Service 1481 UC Confirm Service Contract Termination 1486 UC Enable/Disable Service permanently 1479 UC View Service Contract Details 1245 UC Search and Select Service Contracts
940	FTR Version Service	1239 UC Search and Select Services 1486 UC Enable/Disable Service permanently 1245 UC Search and Select Service Contracts 1494 UC Publish Service 1489 UC Upload Service Specification 1488 UC Upload Service Content 1247 UC Confirm Service Contract Change 1246 UC Create Service Contract Change Request
1446	FTR Search and Select Standard Interfaces	1476 UC View Standard Interface Details 1475 UC Search and Select Standard Interface 1487 UC Download Service Specification
1445	FTR Define new Standard Interface	1257 UC Propose new Standard Interface 1493 UC Publish Standard Interface 1489 UC Upload Service Specification 1476 UC View Standard Interface Details 1475 UC Search and Select Standard Interface
1366	FTR Create Business Partner Account	1373 UC Search and Select Business Partner 1374 UC Create Business Partner Account
1368	FTR Change Business Partner Account	1373 UC Search and Select Business Partner 1376 UC Change Business Partner Account 1377 UC View Business Partner Account Details 1378 UC Change Business Partner Account Details
1369	FTR Activate/Inactivate a Business Partner Account	1373 UC Search and Select Business Partner 1480 UC Create Service Contract Termination Request 1376 UC Change Business Partner Account 1377 UC View Business Partner Account Details 1481 UC Confirm Service Contract Termination 1379 UC Activate Business Partner Account 1380 UC Inactivate Business Partner Account

Table 6.14 Core Marketplace Services - Features and their Use Cases

6.3.2 1617 FTR Marketplace - Authentication and Authorization

The Business Partner has to authenticate against the marketplace. After a successful authentication the marketplace determines his role and controls the access to resources (pages, etc.).

6.3.2.1 1619 UC Marketplace - Logout

Scope & Level	Core Service		
Goal in context	A Business Partner ends a valid user session on the marketplace.		
Preconditions	Business Partner has a valid user session on the marketplace, i.e. he is logged in.		
Successful out-come	The user session of the Business Partner is terminated.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		
Secondary actor	-		
Main scenario	• The Business Partner performs a logout. • The session for the Business Partner is terminated.		
Alternatives	-		
Variations	-		
Related informa-tion	-		
Issues	**Availability:** 24/7 availability required **Performance:** sub-second response time for Marketplace Transactions **Scalability**: capable to grow with electro mobility market		

6.3.2.2 1618 UC Marketplace - Login

Scope & Level	Core Service		
Goal in context	A Business Partner authenticates himself against the marketplace.		
Preconditions	Business Partner is registered before.		
Successful out-come	The Business Partner has access to the marketplace based on his role.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Login failed	Display of an error message	Business Partner does not provide the correct credentials.
Primary actor	1355: ACT Business Partner		
Secondary actor	-		
Main scenario	• The Business Partner provides his credentials. • The marketplace checks the given credentials. • The role of the Business Partner and his access rights are determined. • A session for the Business Partner is created.		
Alternatives	-		
Variations	-		
Related informa-tion	-		

Issues	**Access:**	Role Based Authorization required Password Policy required
	Availability:	24/7 availability required
	Performance:	sub-second response time for Marketplace Transactions
	Scalability:	capable to grow with electro mobility market

6.3.3 924 FTR Search and Select Service

Any Business Partner of the GeM Marketplace can search and select services from the Service Catalogue by optional search parameters.

This Feature is applicable in different contexts / Business Scenario's

- Service Requester may search services for which they have an active or inactive Service Contract.
- Service Requester may search those services which they may contract.

Service Providers may search all services (enabled and disabled services) they have offered.

6.3.3.1 1239 UC Search and Select Services

Scope & Level	Core Service		
Goal in context	Find Services that satisfy search criteria.		
Preconditions	The searching actor is a representative of the Business Partner of the marketplace or a Marketplace Operator		
Successful outcome	The Business Partner receives a list of Services that meet his search criteria and is able to select **one or more** Services from the list for further activities. Search criteria may include the following: • Offered Services by the Business Partner • Available Services for contracting • Contracted Services		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Service is found	Display of an error message	There are no services that meet the search criteria
Primary actor	1355: ACT Business Partner		
Secondary actors	136: ACT Marketplace Operator (Business or Technical)		
Main scenario	• The Business Partner fills the search criteria or load search criteria saved before • The marketplace returns a list of Services that meet the search criteria. • The Business Partner stores optionally the entered search criteria for later use.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access:**	Role Based Authorization required	
	Availability:	24/7 availability required	
	Performance:	sub-second response time for Marketplace Transactions	

	Scalability: capable to grow with electro mobility market

6.3.3.2 1484 UC View Service Details

Scope & Level	Core Service		
Goal in context	View the details of a selected Service		
Preconditions	• The actor is a representative of the Business Partner of the marketplace or the Marketplace Operator • A Service is selected.		
Successful outcome	The Business Partner receives a view of the details of the Service: • Service Interface • Service Description • Downloadable Content (Manual, etc.) • Service Contract Offering or existing Service Contracts		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		
Secondary actors	136: ACT Marketplace Operator (Business or Technical)		
Main scenario	• The Business Partner chooses the details view of a Service. • The detail view is displayed.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access:** Role Based Authorization required **Availability:** 24/7 availability required **Performance:** sub-second response time for Marketplace Transactions **Scalability:** capable to grow with electro mobility market		

6.3.4 1447 FTR Contracting Service

Contracting a service is performed by the potential Service Requester.
This includes the following actions:

- Search and select a service from the Service Catalogue
- View or download Service Interface specification
- Optionally download additional content
- Optionally test the service through a trial period
- Choose options from the Service Contract Offering
- Accept the Service Contract Offering

As a result a valid Service Contract is created by the acceptance of the Service Contract Offering.

6.3.4.1 1485 UC Create Service Contract

Scope & Level	Core Service
Goal in context	A Service Contract is created by accepting a Service Contract Offering by the

	Service Requester.		
Preconditions	A Service Contract Offering is available for a Service at the marketplace.		
Successful outcome	A new Service Contract is created.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Service Contract incomplete	Display of an error message	Not all required sections from the Service Contract Offering are chosen
	Service Contract Offering rejected	• Display a message • Cancellation of the process	Service Requester do not accept the Service Contract Offering
Primary actor	138: ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester chooses a Service and reviews the Service Contract Offering with its options. • The Requester chooses all required sections and may choose available optional sections and is able to store his selection. • The Service Requester accepts the Service Contract Offering with his selection on options. • The chosen sections configure a new Service Contract between the Service Provider and the Service Requester. • The new created Service Contract is stored. • The Service Provider will be notified.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.4.2 1487 UC Download Service Specification

Scope & Level	Core Service		
Goal in context	The Service Requester downloads the service specification, i.e. Service Interface (e.g. WSDL) of an offered Service at his interest.		
Preconditions	A Service is selected.		
Successful outcome	The Service Requester downloads the Service Interface (e.g. WSDL)		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**

Primary actor	138: ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester selects the Service Interface (e.g. WSDL) for download. • The Service Requester starts the download.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Availability:** 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.4.3 1239 UC Search and Select Services

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.3.1

Scope & Level	Core Service. Find Services that satisfy search criteria.

6.3.4.4 1484 UC View Service Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.3.2

Scope & Level	Core Service. View the details of a selected Service

6.3.4.5 1478 UC Download Service Content

Scope & Level	Core Service		
Goal in context	The Service Requester downloads additional content of the offered Service (e.g. manual, ...)		
Preconditions	A Service is selected.		
Successful outcome	The Service Requester downloads additional content of the Service		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	138: ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester selects additional content of the Service for		

	download. • The Service Requester starts the download.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.5 926 FTR Call of Service

The GeM Marketplace enables calls of services that occur when a Service Requester "consumes" the EV Service based upon the conditions of a Service Contract.

The GeM Marketplace links the service calls of the requester to the corresponding Service Providers based on existing Service Contracts.

6.3.5.1 1491 UC Create Service Transaction

Scope & Level	Core Service		
Goal in context	During a service call of a Service by the Service Requester a Service Transaction Entry is created		
Preconditions	A valid call of a Service was performed by a Service Requester.		
Successful outcome	Creation of a Service Transaction Entry.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	138: ACT Service Requester		
Secondary actor	-		
Main scenario	After a valid service call a Service Transaction Entry is created and stored by the marketplace		
Alternatives	-		
Variations	-		
Related information	Service calls with failures have to be logged separately.		
Issues	**Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance:** sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.5.2 1241 UC Call of Service

Scope & Level	Core Service		
Goal in context	The Service Requester performs a call of a contracted Service and receives the result. Usually the service call is originated by an end user of the Service Requester.		
Preconditions	The Service Requester has a valid Service Contract (not suspended) with the Service Provider.		
Successful outcome	The Service Requester receives the result of a service call from the contracted Service Provider.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Invalid Request	Creation of an error response message and a log entry.	The service request is not compatible with the Service Interface.
Primary actor	138: ACT Service Requester		
Secondary actors	137: ACT Service Provider		
Main scenario	• The Service Requester makes a request based on the Service Interface Specification to the marketplace. • The marketplace routes the request to the contracted Service Provider. • The Service Provider fulfills the request or displays an error message. • A Service Transaction Entry will be created by the marketplace. • The response of the Service is routed back to the Service Requester		
Alternatives	-		
Variations	If the Service Requester has more than one valid Service Contracts (not suspended) with different Service Providers for the same request (based on the Service Interface Specification) the results will be aggregated. (Described in UC Aggregate Service Calls)		
Related information	-		
Issues	**Access**: Certificate Mechanism or equivalent is required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.5.3 1245 UC Search and Select Service Contracts

Scope & Level	Core Service
Goal in context	Find Service Contracts that satisfy search criteria.
Preconditions	The searching actor is a representative of the Business Partner of the marketplace or the Marketplace Business Operator
Successful outcome	The Business Partner receives an ordered list of his **own** Service that meets his search criteria and is able to select **one or more** Service from the list for further activities.

	Search criteria may include: • Valid and terminated Service Contracts • Active and suspended Service Contracts • Service Contracts for prolongation		
Failure outcome	**Failure**	**Outcome**	**Condition leading to out-come**
	No Service Con-tracts are found	Display of an error mes-sage	There are no service contracts that meet the search criteria
Primary actor	1355: ACT Business Partner		
Secondary actors	1367: ACT Marketplace Business Operator		
Main scenario	• The Business Partner fills the search criteria or load search criteria saved before • The marketplace returns a list of Service Contracts that meet the search criteria. • The Business Partner stores optionally the entered search criteria for later use.		
Alternatives	-		
Variations	The Marketplace Business Operator is able to receive a list of all Service Con-tracts.		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required Scalability: capable to grow with electro mobility market		

6.3.6 1459 FTR Aggregate Service Call Results

A Service Requester can have Service Contracts with multiple Service Providers for the same functionality.
The GeM Marketplace has to enable service calls to all contracted Service Providers and has to aggregate the results of the different Service Providers.

As a precondition the Service Requester and all of the Service Providers have to implement an identical Standard Interface.

6.3.6.1 1492 UC Aggregate Service Call Results

Scope & Level	Core Service
Goal in context	The Service Requester performs a call of a Standard Interface based Service for which he has more than one Service Contract with different Service Providers. It results in service calls on all contracted Services. The results of the calls will be aggregated by the marketplace and one response is returned to the Service Re-quester.

<table>
<tr><td>Preconditions</td><td colspan="3">• The Service Requester has more than one valid Service Contracts (not suspended) with different Service Providers.
• The service request is based on a Standard Interface</td></tr>
<tr><td>Successful outcome</td><td colspan="3">The Service Requester receives one single result of a service call that is routed to different Service Providers.</td></tr>
<tr><td>Failure outcome</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td>Invalid Request</td><td>• Creation of an error response message</td><td>The service request is not compatible with the Service Interface.</td></tr>
<tr><td></td><td>Single Response Error</td><td>• Creation of an information message included in the result
• Aggregation of the remaining results</td><td>Technical Issues</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">138: ACT Service Requester</td></tr>
<tr><td>Secondary actors</td><td colspan="3">137: ACT Service Provider</td></tr>
<tr><td>Main scenario</td><td colspan="3">• The Service Requester performs a request based upon a Standard Interface Specification to the marketplace.
• The marketplace routes the request to every contracted Service Provider.
• The Service Provider fulfills the request or displays an error message.
• A Service Transaction Entry will be created for each service call to a Service Provider by the marketplace.
• The marketplace collects the responses of each single service call and aggregates the results to one service response.
• The response of the Service is routed back to the Service Requester</td></tr>
<tr><td>Alternatives</td><td colspan="3">-</td></tr>
<tr><td>Variations</td><td colspan="3">-</td></tr>
<tr><td>Related information</td><td colspan="3">-</td></tr>
<tr><td>Issues</td><td colspan="3">Access: Certificate Mechanism or equivalent is required
Data Security: Data Integrity must be guaranteed
Data Confidentiality must be ensured
Data Privacy: Sensitive Data is only stored when needed and authorized
Data Export Policy required
Performance: sub-second response for Service Transactions, incl. Marketplace
Availability: 24/7 availability required
Scalability: capable to grow with electro mobility market</td></tr>
</table>

6.3.7 1685 FTR Create Notification to Service Requester

The Service Provider or the Marketplace Operator is able to send notifications to the Service Requester of his own Service

6.3.7.1 1687 UC Notify Service Requesters of own Service

Scope & Level	Core Service		
Goal in context	The Service Provider or the Marketplace Operator sends notifications to the Service Requester of his **own** Service.		
Preconditions	A Service is selected.		
Successful outcome	The Service Requester of a Service is notified.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	137: ACT Service Provider		
Secondary actors	136: ACT Marketplace Operator		
Main scenario	• The Service Provider or the Marketplace Operator fills a form to create a notification to the Service Requester of his **own** Service. • The Service Requester of a Service is notified.		
Alternatives	-		
Variations	-		
Related information	This use case represents a simple notification. There will be no information for the Service Provider, if the Service Requester has received the notification.		
Issues	**Access**: Role Based Authorization required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.8 1622 FTR Manage Requests for new Services

The marketplace provides the capability to create Requests for a new Service.

A potential Service Requester creates a Request for a new Service, which is basically a simple textual description of the service. Potential Service Providers can view the Requests and are able to notify the Service Requester, if they are willing to fulfill the Request, i.e. to implement the Service and offer it on the marketplace.

6.3.8.1 1625 UC Create Request for a new Service

Scope & Level	Core Service		
Goal in context	If there is no suitable Service, the Service Requester is able to create a Request for a new Service.		
Preconditions	-		
Successful outcome	A new Request for a new Service is created.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request for a new Service is incomplete	Display of an error message	Not all required attributes of the Request for a new Service are filled.

Primary actor	138: ACT Service Requester
Secondary actor	-
Main scenario	• The Service Requester fills a form with the requirements of the Request for a new Service. • The newly created Request for a new Service is stored.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability:** 24/7 availability required **Scalability:** capable to grow with electro mobility market

6.3.8.2 1623 UC View Details of Requests of new Services

Scope & Level	Core Service		
Goal in context	View the details of a selected Request of a new Service		
Preconditions	• The actor is a representative of the Business Partner of the marketplace or the Marketplace Operator • A Request of a new Service is selected.		
Successful outcome	The Business Partner receives a view of the details of the Request of a new Service, e.g.: • Requirements • Pre-/Post conditions		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		
Secondary actors	136: ACT Marketplace Operator (Business or Technical)		
Main scenario	• The Business Partner chooses the details view of a Request of a new Service. • The detail view is displayed.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility		

6.3.8.3 1629 UC Create Response on Requests for new Services

Scope & Level	Core Service		
Goal in context	Potential Service Providers are able to create a response to a Request for new Services, if they are willing to implement and offer a Service that fulfillsthe request.		
Preconditions	A Request for new Services is selected.		
Successful outcome	A new response to a Request for a new Service is created and the Service Requester is notified.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	137: ACT Service Provider		
Secondary actors	138: ACT Service Requester		
Main scenario	• The Service Provider fills a form for the response of a Request for a new Service. • The new created response on a Request for a new Service is stored. • The Service Requester is notified.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.8.4 1620 UC Search and Select Requests for new Services

Scope & Level	Core Service		
Goal in context	Find Requests for new Services that satisfy search criteria.		
Preconditions	The searching actor is a representative of the Business Partner of the marketplace or a Marketplace Operator		
Successful outcome	The Business Partner receives a list of Requests for new Services that meet his search criteria and is able to select **one or more** Requests from the list for further activities.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Requests for new Services is found	Display of a warning message	There are no requests that meet the search criteria
Primary actor	1355: ACT Business Partner		
Secondary actors	136: ACT Marketplace Operator (Business or Technical)		
Main scenario	• The Business Partner fills the search criteria or load search criteria saved before • The marketplace returns a list of Requests for new Services that meet the search criteria. • The Business Partner stores optionally the entered search criteria for later		

	use.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.8.5 1626 UC Change Request for a new Service

Scope & Level	Core Service		
Goal in context	The Service Requester changes his **own** Request.		
Preconditions	An existing Request for a new Service is selected.		
Successful outcome	An existing Request for a new Service is changed.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request for a new Service is incomplete	Display of an error message	Not all required attributes of the Request for a new Service are filled.
Primary actor	138: ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester changes the attributes in a prefilled form with the requirements of his own Request. • The changed Request for a new Service is stored.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.8.6 1627 UC Delete Request for a new Service

Scope & Level	Core Service		
Goal in context	The Service Requester deletes his **own** Request.		
Preconditions	An existing Request for a new Service is selected.		
Successful outcome	An existing Request for a new Service is deleted.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**

Primary actor	138: ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester requests the deletion of his own Request. • The Request for a new Service is deleted in the system.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Privacy:** Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.9 927 FTR Service Transaction overview

Any Business Partner can obtain an overview of his own Service Transactions.
The Business Partner requesting the overview must play an original or delegated role in the transaction (buyer / seller / debtor / creditor).

There may be certain selection criteria:

- Date range selection
- Filters on each of the roles (buyer / seller / debtor / creditor)
- Filters on the magnitude of the Transaction Value (may already be part of the Service filters)

6.3.9.1 1239 UC Search and Select Services

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.3.1

Scope & Level	Core Service. Find Services that satisfy search criteria.

6.3.9.2 1471 UC View Service Transaction Details

Scope & Level	Core Service		
Goal in context	View the details of a Service Transaction.		
Preconditions	• The actor is a representative of the Business Partner of the marketplace or the Marketplace Business Operator • A Service that the Business Partner provides or uses is selected		
Successful out-come	The Business Partner views the details of an **own** Service.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		

Secondary actors	1367: ACT Marketplace Business Operator
Main scenario	• The Business Partner chooses the details view of a Service that it provides or uses. • The detail view is displayed.
Alternatives	-
Variations	The Marketplace Business Operator is able to view the details of all Service Transactions.
Related information	-
Issues	**Access**: Role Based Authorization required **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility

6.3.9.3 1242 UC Search and Select Service Transactions

Scope & Level	Core Service		
Goal in context	Find Service Transactions that satisfy search criteria.		
Preconditions	• The searching actor is a representative of the Business Partner of the marketplace or the Marketplace Business Operator • The Business Partner has a valid or terminated Service Contract belonging to the Service		
Successful outcome	The Business Partner receives an ordered list of his **own** Service that meets his search criteria and is able to export the list. E.g. search criteria may include: • Service Transactions of a given Service i.e. of a given Service Contract • Service Transactions of services of a given Business Partner • Service Transactions in a given time-frame		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Service Transactions are found	Display of an error message	There are no service transactions that meet the search criteria.
Primary actor	1355: ACT Business Partner		
Secondary actors	1367: ACT Marketplace Business Operator		
Main scenario	• The Business Partner fills the search criteria or load search criteria saved before • The marketplace returns a list of Service Transactions that meet the search criteria. • The Business Partner stores optionally the entered search criteria for later use. • The search result can be exported.		
Alternatives			
Variations	The Marketplace Business Operator is able to receive a list of all Service Transactions.		
Related information			
Issues	**Access**: Role Based Authorization required		

	Data Security: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.10 935 FTR Provide Service Contract Framework

It is in the intention of the GeM Marketplace to have standardized Service Contracts between the Service Provider and the Service Requester to support easier contract negotiation.

For that reason the GeM Marketplace has to provide a Service Contract Framework based on modules, which the Service Provider has to choose during the service registration process to define its Service Contract Offering.

The Service Contract Framework itself can be static and provided by a platform independent representation(e.g. XML).

6.3.10.1 1482 UC View Service Contract Template

Scope & Level	Core Service		
Goal in context	The template of the Service Contract Framework is displayed to the Business Partner		
Preconditions	Contents of the Service Contract Framework are provided to the marketplace by a static platform independent representation(e.g. XML).		
Successful outcome	The Business Partner is be able to view the contents with all available options of the Service Contract Framework		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	-		.
	-		
	-		
Primary actor	1355: ACT Business Partner		
Secondary actor	1367: ACT Marketplace Business Operator		
Main scenario	• The Business Partner chooses the details view of the contents with all available options of the Service Contract Framework • The detail view is displayed.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.11 1396 FTR Define and Register Service Contract

During the service registration process the Service Provider has to establish a Service Contract Offering based on the Service Contract Framework:

- The Service Provider chooses the necessary modules from the Service Contract Framework. This may include optional modules that can be chosen by the Service Requester (service contract variations). He provides an offering of a set of service contracts.
- The Service Requester can choose from the set of Service Contract Offerings and has to accept at least one.

6.3.11.1 1485 UC Create Service Contract

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.4.1

Scope & Level	Core Service. A Service Contract is created by accepting a Service Contract Offering by the Service Requester.

6.3.11.2 1482 UC View Service Contract Template

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.10.1

Scope & Level	Core Service.The template of the Service Contract Framework is displayed to the Business Partner

6.3.11.3 1624 UC Change Service Contract Offering

Scope & Level	Core Service		
Goal in context	An existing Service Contract Offering can be changed from the template of the Service Contract Framework by the Service Provider. Existing Service Contracts based on the Service Contract Offering are not affected.		
Preconditions	• Contents of the Service Contract Framework are provided to the marketplace by a static platform independent representation (e.g. XML). • A Service Contract Offering is selected		
Successful outcome	An existing Service Contract Offering is changed.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Service Contract Offering incomplete	Display of an error message	Not all required sections from the service contract framework are chosen
Primary actor	137: ACT Service Provider		
Secondary actor	-		
Main scenario	• The Service Provider changes optional sections from the Service Contract Framework . • The chosen sections configure a changed Service Contract Offering.		

	• The changed Service Contract Offering is stored.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.11.4 1479 UC View Service Contract Details

Scope & Level	Core Service		
Goal in context	View the details of a Service Contract.		
Preconditions	• The actor is a representative of the Business Partner of the marketplace or the Marketplace Business Operator • One of the Business Partner's own Service Contracts is chosen		
Successful outcome	The Business Partner views the details and history of one of its **own** Service Contracts, e.g.: • Terms and conditions • Pricing • Contract period		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		
Secondary actors	1367: ACT Marketplace Business Operator		
Main scenario	• The Business Partner chooses the details view of an own Service • The detail view is displayed.		
Alternatives	-		
Variations	The Marketplace Business Operator is able to view the details of all Service Contracts.		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required		

	Scalability: capable to grow with electro mobility market

6.3.11.5 1470 UC Create Service Contract Offering

Scope & Level	Core Service		
Goal in context	During the service registration a Service Contract Offering is created from the template of the Service Contract Framework by the Service Provider		
Preconditions	Contents of the Service Contract Framework are provided to the marketplace by a static platform independent representation(e.g. XML).		
Successful out-come	A new Service Contract Offering is created.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Service Contract Offering incomplete	Display of an error message	Not all required sections from the service contract framework are chosen
Primary actor	137: ACT Service Provider		
Secondary actor	-		
Main scenario	• The Service Provider chooses all of the required sections and additionally optional sections from the Service Contract Framework . • The chosen sections configure a new Service Contract Offering. • The new created Service Contract Offering is stored.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability:** 24/7 availability required **Scalability:** capable to grow with electro mobility market		

6.3.11.6 1484 UC View Service Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.3.2

Scope & Level	Core Service. View the details of a selected Service

6.3.12 931 FTR Change or Terminate Service Contract

Any Service Contract can be changed or terminated at any time if both Business Partners (Service Provider and Service Requester) agree.
This is implemented in a two-step (asynchronous) process.

- The first Business Partner requests unilateral contract change or termination by the other Business Partner
- This action is reported to both Business Partners.

- The other Business Partner can then accept or decline at will.

Note: The requesting Business Partner should be able to revoke a request that is still pending!

6.3.12.1 1480 UC Create Service Contract Termination Request

Scope & Level	Core Service		
Goal in context	A termination of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) makes a termination request on a Service Contract.		
Preconditions	A Service Contract between the Service Provider and the Service Requester exists and is selected.		
Successful outcome	A termination request of a Service Contract is created and the other Business Partner is notified.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Request Form incomplete	Display of an error message	Business Partner filled the form not completely
Primary actor	1355: ACT Business Partner (137: ACT Service Provider or 138: ACT Service Requester)		
Secondary actors	-		
Main scenario	• The Business Partner fills a form for the termination request on the Service Contract. • A Service Contract History Entry is created • The other Business Partner is notified.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance:** sub-second response for Service Transactions, incl. Marketplace **Availability:** 24/7 availability required **Scalability:** capable to grow with electro mobility market		

6.3.12.2 1481 UC Confirm Service Contract Termination

Scope & Level	Core Service
Goal in context	A termination of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) accepts or rejects a termination request on a Service Contract made by the other Business Partner.
Preconditions	• A Service Contract between the Service Provider and the Service Requester exists. • The Business Partner has been notified on a termination request on the Service Contract
Successful outcome	The termination request on the Service Contract is accepted or rejected. The other Business Partner is notified.

Failure outcome	Failure	Outcome	Condition leading to outcome
Primary actor	1355: ACT Business Partner (137: ACT Service Provider or 138: ACT Service Requester)		
Secondary actors	-		
Main scenario	• The Business Partner accepts or rejects the termination request on the Service Contract. • The Service Contract is terminated. • A Service Contract History Entry is created • The other Business Partner is notified.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.12.3 1479 UC View Service Contract Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.11.4

Scope & Level	Core Service. View the details of a Service Contract.

6.3.12.4 1245 UC Search and Select Service Contracts

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.5.3

Scope & Level	Core Service. Find Service Contracts that satisfy search criteria.

6.3.12.5 1247 UC Confirm Service Contract Change

Scope & Level	Core Service
Goal in context	A change of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) accepts or rejects a change request on a Service Contract made by the other Business Partner.
Preconditions	• A Service Contract between the Service Provider and the Service Requester exists. • The Business Partner has been notified of a change request on the Service Contract

Successful outcome	The change request (e.g. terms & conditions, pricing) on a Service Contract is accepted or rejected by the other Business Partner.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner (137: ACT Service Provider or 138: ACT Service Requester)		
Secondary actors	-		
Main scenario	• The Business Partner accepts or rejects the change request on the Service Contract. • The Service Contract is changed. • A Service Contract History Entry is created • The other Business Partner is notified.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.12.6 1246 UC Create Service Contract Change Request

Scope & Level	Core Service		
Goal in context	A change of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) makes a change request on a Service Contract.		
Preconditions	A Service Contract between the Service Provider and the Service Requester exists and is selected.		
Successful outcome	A change request on a Service Contract is created and the other Business Partner is notified.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Request Form incomplete	Display of an error message	Business partner failed to complete the form correctly
Primary actor	1355: ACT Business Partner (137: ACT Service Provider or 138: ACT Service Requester)		
Secondary actors			
Main scenario	• The Business Partner fills a form for the change request on the Service Contract.		

	• A Service Contract History Entry is created • The other Business Partner is notified.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.13 1469 FTR Suspend/Resume Service Contract

The Service Requester can suspend/resume his own Contracts. Suspended Service Contracts will not be taken in account during service calls.
But the Service Contract remains still valid.

6.3.13.1 1479 UC View Service Contract Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.11.4

Scope & Level	Core Service. View the details of a Service Contract.

6.3.13.2 1245 UC Search and Select Service Contracts

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.5.3

Scope & Level	Core Service. Find Service Contracts that satisfy search criteria.

6.3.13.3 1490 UC Suspend/Resume Service Contract by Service Requester

Scope & Level	Core Service		
Goal in context	A Service Requester suspends or resumes a Service Contract, i.e. the Service Contract itself is not changed or terminated, but indicated as not to use during a service call.		
Preconditions	A Service Contract between the Service Provider and the Service Requester exists and is selected.		
Successful outcome	A Service Contract is suspended or resumed by the Service Requester.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	138: ACT Service Requester		
Secondary actors	-		
Main scenario	• The Service Requester marks the Service Contract as suspended, respectively for use. • An Service Contract History Entry is created		
Alternatives	-		

Variations	-
Related information	-
Issues	Is the Service Provider able to view the suspended contracts of his own services? **Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.14 1315 FTR Register Service

Any Service Provider can register an EV Service at the Marketplace. This can be a completely new service or a new version of an existing service.

The registration of a service includes the following actions:

- Providing the Service Interface and a Service Description. The Service Interface should be a Standard Interface.
- Optionally, providing downloadable content, e.g. service manual, portlet used by the Service Requester's end user portal, or an app for a mobile device
- Creation of a Service Contract Offering based on the Service Contract Framework
- Providing cloud execution information
- Acceptance of the Service Registration Contract of the GeM Marketplace
- Testing of the service by the Marketplace Technical Operator
- Creation of an entry in the Service Catalogue and optionally an entry in the Image Catalogue.

Note: Any changes on a registered service result in a new service version.

6.3.14.1 1477 UC Create Service Registration Contract

Scope & Level	Core Service		
Goal in context	During the service registration the Service Provider has to accept the Service Registration Contract of the marketplace.		
Preconditions	The Service Registration Contract is provided by the marketplace.		
Successful outcome	The Service Provider accepts the terms and conditions of the Service Registration Contract. The result is stored by the marketplace.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Service Registration Contract is not accepted	• Display of an error message • Cancellation of the service registration	Business Partner has not accepted the Service Registration Contract.
Primary actor	137: ACT Service Provider		
Secondary actor	-		

Main scenario	• The Service Provider accepts the terms and conditions of the Service Registration Contract. • The valid Service Registration Contract is stored by the marketplace.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.14.2 1482 UC View Service Contract Template

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.10.1

Scope & Level	Core Service. The template of the Service Contract Framework is displayed to the Business Partner

6.3.14.3 1494 UC Publish Service

Scope & Level	Core Service		
Goal in context	A Service is published at the marketplace.		
Preconditions	A Service is registered and selected.		
Successful outcome	The use case exists in two different contexts: • Publish a new Service • Publish a new version of the Service, i.e. existing Service Contracts have to be changed depending on the contract conditions.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Unchanged Contracts exists	• Notification of the Service Provider • Cancellation of the publishing process	Not all Service Contracts are changed as necessary.
Primary actor	137: ACT Service Provider		
Secondary actors	1402: ACT Marketplace Technical Operator		
Main scenario	• The Service Provider requests the publishing of the Service • In case of a new version of the Service a change of all Service Contracts has to be performed.		

	• The Marketplace Technical Operator enables or disables the Service in the Service Catalogue. • The Service Provider is notified.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.14.4 1489 UC Upload Service Specification

Scope & Level	Core Service		
Goal in context	During the service registration the Service Provider uploads the service specification, i.e. Service Interface(e.g. WSDL) and Service Description of the offered Service		
Preconditions	A Service is selected.		
Successful outcome	The Service Interface (e.g. WSDL) and the Service is uploaded to the marketplace.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Validation Error	Display of an error message	The formal validation of the Service Interface failed.
Primary actor	137: ACT Service Provider		
Secondary actor	-		
Main scenario	• The Service Provider uploads the Service Interface (e.g. WSDL) and the Service. • The marketplace performs a formal validation of the Service Interface. • The service specification (Service Interface and Service Description) is stored at the marketplace.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.14.5 1470 UC Create Service Contract Offering

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.11.5

Scope & Level	Core Service. During the service registration a Service Contract Offering is created from the template of the Service Contract Framework by the Service Provider

6.3.14.6 1488 UC Upload Service Content

Scope & Level	Core Service		
Goal in context	During the service registration the Service Provider may upload additional content of the offered Service (e.g. manual, ...)		
Preconditions	A Service is selected.		
Successful out-come	Additional content is uploaded to the marketplace.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	137: ACT Service Provider		
Secondary actor	-		
Main scenario	• The Service Provider uploads additional content of the Service • The content is stored at the marketplace.		
Alternatives	-		
Variations	-		
Related informa-tion	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance:** sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.14.7 1250 UC Register Service

Scope & Level	Core Service		
Goal in context	A Service is registered at the marketplace.		
Preconditions	• The Service Interface and the Service Description is uploaded • The Service Provider has accepted the Service Registration Contract		
Successful out-come	The Service is registered.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
			.
Primary actor	137: ACT Service Provider		
Secondary actors	1402: ACT Marketplace Technical Operator		

Main scenario	• The Service Provider requests the registration of a Service • The Marketplace Technical Operator registers the Service in the Service Catalogue. • The Service is disabled until it is published, i.e. enabled permanently in the context of a registration. • The Service Provider is notified.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.14.8 1476 UC View Standard Interface Details

Scope & Level	Core Service		
Goal in context	View Standard Interfaces details.		
Preconditions	• The searching actor is a representative of a Business Partner of the marketplace or the Marketplace Technical Operator • A Standard Interface is chosen		
Successful outcome	The Business Partner views the following details of the chosen Standard Interface: • Interface specification of Standard Interface • Interface description of the Standard Interface		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		
Secondary actors	1402: ACT Marketplace Technical Operator		
Main scenario	• The Business Partner chooses the details view of a Standard Interface. • The detail view is displayed.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.14.9 1475 UC Search and Select Standard Interface

Scope & Level	Core Service		
Goal in context	Find Standard Interfaces that satisfy search criteria.		
Preconditions	The searching actor is a representative of a Business Partner of the marketplace or the Marketplace Technical Operator		
Successful outcome	The Business Partner receives an ordered list of available Standard Interfaces that meet his search criteria and is able to select a Standard Interface from the list for further activities, like view details or download interface specification. E.g. search criteria may include: • Proposed and published Standard Interfaces • Standard Interfaces by category		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Standard Interfaces are found	Display of an error message	There are no standard interfaces that meet the search criteria
Primary actor	1355: ACT Business Partner		
Secondary actors	1402: ACT Marketplace Technical Operator		
Main scenario	• The Business Partner fills the search criteria or load search criteria saved before • The marketplace returns a list of Standard Interfaces that meet the search criteria. • The Business Partner may store the entered search criteria for later use		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.15 1443 FTR Enable / Disable Service

The GeM Marketplace must provide the ability to enable and disable a service.
There are two different scenarios for enabling and disabling:

- **Enable/Disable permanently**, i.e. the disabling is requested by the Service Provider and all affected Service Requester have to be notified and they have to agree. This results in a termination of their existing Service Contract.
- **Enable/Disable temporarily**, i.e. starting and stopping the service performed by the Marketplace Technical Operator, e.g. on technical issues.

6.3.15.1 1255 UC Start/Stop Service

Scope & Level	Core Service
Goal in context	A Service can be temporarily disabled.
Preconditions	• A Service is selected. • The Service is available and published.

Successful out-come	The Status of the Service has changed (Started or Stopped)		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Status Error	Display of an error message	Service is not in status "Pub-lished"
	Start Error	Display of an error message	Service is not stopped.
	Stop Error	Display of an error message	Service is not started
Primary actor	1402: ACT Marketplace Technical Operator		
Secondary actors	-		
Main scenario	• The Marketplace Technical Operator starts or stops the selected Service. • The new status of the Service is displayed.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	Current and pending transactions must not be adversely affected. **Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.15.2 1480 UC Create Service Contract Termination Request

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.12.1

Scope & Level	Core Service. A termination of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) makes a termination request on a Service Contract.

6.3.15.3 1687 UC Notify Service Requesters of own Service

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.7.1

Scope & Level	Core Service. The Service Provider or the Marketplace Operator sends notifica-tions to the Service Requester of his **own** Service.

6.3.15.4 1481 UC Confirm Service Contract Termination

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.12.2

Scope & Level	Core Service A termination of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) accepts or rejects a termination request on a Service Contract made by the other Business Partner.

6.3.15.5 1486 UC Enable/Disable Service permanently

Scope & Level	Core Service
Goal in context	A service may be permanently enabled or disabled.

Preconditions	• A Service is selected. • The Service has no active Service Contracts, i.e. all Service Contracts have to be terminated. • The Service is stopped.		
Successful outcome	The Service is disabled or enabled.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Active Contracts exists	• Notification of the Service Provider • Cancellation of the disabling process	Not all Service Contracts are terminated.
Primary actor	137: ACT Service Provider		
Secondary actors	1402: ACT Marketplace Technical Operator		
Main scenario	• The Service Provider requests an enabling or disabling of the Service • The Marketplace Technical Operator enables or disables the Service in the Service Catalogue. • The Service Provider is notified.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.15.6 1479 UC View Service Contract Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.11.4

Scope & Level	Core Service. View the details of a Service Contract.

6.3.15.7 1245 UC Search and Select Service Contracts

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.5.3

Scope & Level	Core Service. Find Service Contracts that satisfy search criteria.

6.3.16 940 FTR Version Service

Services can be changed by the Service Provider. This results in a new Service Version.

6.3.16.1 1239 UC Search and Select Services

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.3.1

Scope & Level	Core Service. Find Services that satisfy search criteria.

6.3.16.2 1486 UC Enable/Disable Service permanently

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.15.5

Scope & Level	Core Service. A service may be permanently enabled or disabled.

6.3.16.3 1245 UC Search and Select Service Contracts

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.5.3

Scope & Level	Core Service. Find Service Contracts that satisfy search criteria.

6.3.16.4 1494 UC Publish Service

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.3

Scope & Level	Core Service. A Service is published at the marketplace.

6.3.16.5 1489 UC Upload Service Specification

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.4

Scope & Level	Core Service. During the service registration the Service Provider uploads the service specification, i.e. Service Interface(e.g. WSDL) and Service Description of the offered Service

6.3.16.6 1488 UC Upload Service Content

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.6

Scope & Level	Core Service. During the service registration the Service Provider may upload additional content of the offered Service

6.3.16.7 1247 UC Confirm Service Contract Change

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.12.5

Scope & Level	Core Service. A change of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) accepts or rejects a change request on a Service Contract made by the other Business Partner.

6.3.16.8 1246 UC Create Service Contract Change Request

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.12.6

Scope & Level	Core Service. A change of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) makes a change request on a Service Contract.

6.3.17 1446 FTR Search and Select Standard Interfaces

Service Providers can search and select published Standard Interfaces from the Standard Interface Catalogue.

Service Providers may view or download the Standard Interface specification (e.g. WSDL) and the corresponding documentation for use of the development of their own services.

6.3.17.1 1476 UC View Standard Interface Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.8

Scope & Level	Core Service. View Standard Interfaces details.

6.3.17.2 1475 UC Search and Select Standard Interface

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.9

Scope & Level	Core Service. Find Standard Interfaces that satisfy search criteria.

6.3.17.3 1487 UC Download Service Specification

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.4.2

Scope & Level	Core Service. The Service Requester downloads the service specification.

6.3.18 1445 FTR Define new Standard Interface

Business Partner may propose a new Standard Interface.

- The proposed interface has to be reviewed by the GeM Marketplace and optionally by additional Business Partners.
- After acceptance the new Standard Interface will be published in the Standard Interface Catalogue.

6.3.18.1 1257 UC Propose new Standard Interface

Scope & Level	Core Service
Goal in context	A Business Partner (Service Provider or Service Requester) can propose a Service Interface Specification as a Standard Interface. The proposed Standard Interface has to be reviewed and accepted by the Marketplace Technical Operator

	and other Business Partners.		
Preconditions	The proposed Service Interface is uploaded.		
Successful outcome	A new Standard Interface is proposed and reviewed.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Rejection of Standard Interface	• Notification of the other Business Partners. • Cancellation of acceptance process	A Business Partner or the Marketplace Technical Director rejects the interface.
	Standard Interface exists	• Notification of the other Business Partners. • Cancellation of acceptance process	The interface exists already as Standard Interface.
Primary actor	1355: ACT Business Partner		
Secondary actors	1355: ACT Business Partner, 1402: ACT Marketplace Technical Operator		
Main scenario	• The Business Partner proposes a Service Interface of a chosen Service as Standard Interface. • The Service Interface is reviewed and accepted as Standard Interface by the Marketplace Technical Operator • Optionally, the Service Interface is reviewed and accepted as Standard Interface by other Business Partners. • Notification of all Business Partners.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.18.2 1493 UC Publish Standard Interface

Scope & Level	Core Service		
Goal in context	A Service Interface is published as Standard Interface at the marketplace.		
Preconditions	The Service Interface is proposed, reviewed and accepted as Standard Interface.		
Successful outcome	An entry in the Standard Interface Catalogue for the Standard Interface is created and the Business Partners are notified.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**

Primary actor	1402: ACT Marketplace Technical Operator
Secondary actors	-
Main scenario	• The Marketplace Technical Operator creates an entry in the Standard Interface Catalogue for the Standard Interface • The Business Partners are notified.
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility

6.3.18.3 1489 UC Upload Service Specification

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.4

Scope & Level	Core Service. During the service registration the Service Provider uploads the service specification, i.e. Service Interface(e.g. WSDL) and Service Description of the offered Service

6.3.18.4 1476 UC View Standard Interface Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.8

Scope & Level	Core Service. View Standard Interfaces details.

6.3.18.5 1475 UC Search and Select Standard Interface

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.14.9

Scope & Level	Core Service. Find Standard Interfaces that satisfy search criteria.

6.3.19 1366 FTR Create Business Partner Account

For a Business Partner, that requests access to the GeM Marketplace, the following actions have to be approved by the Marketplace Business Manager:

- Creation of a Business Partner Object in the GeM Marketplace
- Provision of an access mechanism to the GeM Marketplace
- Partner Contract between the Business Partner and the GeM Marketplace

6.3.19.1 1373 UC Search and Select Business Partner

Scope & Level	Core Service		
Goal in context	Find Business Partners that satisfy search criteria.		
Preconditions	The searching actor is the Marketplace Business Operator		
Successful outcome	The Marketplace Business Operator receives an ordered list of the Business Partners that meet his search criteria and is able to select **one or more** Business from the list for further activities. Search criteria may include: • Business Partners that act as Service Providers • Business Partners that act as Service Requester • Active and inactive Business Partners		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Business Partners found	Display of an error message	There are no business partners that meet the search criteria
Primary actor	1367: ACT Marketplace Business Operator		
Secondary actors	-		
Main scenario	• The Business Partner fills the search criteria or load search criteria saved before • The marketplace returns a list of Business Partners that meet the search criteria. • The Business Partner stores optionally the entered search criteria for later use.		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security:** Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.19.2 1374 UC Create Business Partner Account

Scope & Level	Core Service		
Goal in context	A new Business Partner is registered at the marketplace.		
Preconditions	Business Partner was not registered before.		
Successful outcome	The Business Partner is created in the system at his request.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request not complete	• Display of an error message • Cancellation of the registration	Request Form is not filled correctly.
	Partner Contract not accepted	• Display of an error message • Cancellation of the registration	The partner contract was not accepted.

Primary actor	1355: ACT Business Partner
Secondary actor	1367: ACT Marketplace Business Operator
Main scenario	• Registration Request Form (company data and responsible person) filled and submitted by a representative of the Business Partner. • Acceptance of the Partner Contract by the Business Partner • Creation of a Business Partner in the System by the Marketplace Business Operator. • Provision of an access mechanism (Access Data) • Notification to the Business Partner
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.20 1368 FTR Change Business Partner Account

A registered Business Partner can request a change of his data. The following actions have to be taken by the Marketplace Business Manager:

- Check of the Service Contracts of the Business Partner has to be performed
- Change of the Business Partner Object in the GeM Marketplace

Check of the Partner Contract between the Business Partner and the GeM Marketplace has to be performed

6.3.20.1 1373 UC Search and Select Business Partner

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.19.1

Scope & Level	Core Service.Find Business Partners that satisfy search criteria.

6.3.20.2 1376 UC Change Business Partner Account

Scope & Level	Core Service		
Goal in context	Data of a Business Partner are changed.		
Preconditions	Business Partner is registered at the marketplace		
Successful outcome	The Business Partner is changed in the system at his request.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request not complete	• Display of an error message • Cancellation of the change re-	Request Form is not filled correctly

		quest	
Primary actor	1355: ACT Business Partner		
Secondary actor	1367: ACT Marketplace Business Operator		
Main scenario	This use case act as parent of other use cases for changing partner data. • Change Request Form filled and submitted by a representative of the Business Partner. • Change of the Business Partner data in the system by the Marketplace Business Manager. • Notification of the Business Partner		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.20.3 1377 UC View Business Partner Account Details

Scope & Level	Core Service		
Goal in context	View details of a Business Partner		
Preconditions	• The actor is a representative of a Business Partner of the marketplace or the Marketplace Business Operator • A Business Partner is chosen.		
Successful outcome	The Business Partner views the details of a Business Partner or his own details. In case of his own data, he will view his Partner Contract as well.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	1355: ACT Business Partner		
Secondary actors	1367: ACT Marketplace Business Operator		
Main scenario	• The Business Partner chooses the details view of a Business Partner or his own details. • The detail view is displayed.		
Alternatives	-		
Variations	The Marketplace Business Operator is able to view all data of the Business Partners and their Partner Contracts		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required		

	Performance: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.20.4 1378 UC Change Business Partner Account Details

Scope & Level	Core Service		
Goal in context	Detail Data of a Business Partner are changed.		
Preconditions	Business Partner is registered at the marketplace		
Successful out-come	The detail data of a Business Partner are changed in the system at his request.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request not complete	• Display of an error message • Cancellation of the change re-quest	Request Form is not filled correctly
Primary actor	1355: ACT Business Partner		
Secondary actor	1367: ACT Marketplace Business Operator		
Main scenario	• Change Request Form filled and submitted by a representative of the Business Partner. • Change of the Business Partner detail data in the system by the Marketplace Business Manager. • Notification of the Business Partner		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy**: Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market		

6.3.21 1369 FTR Activate/Inactivate a Business Partner Account

A registered Business Partner can request an inactivation of his active account, as well as an activation of his inactive account.
The following actions have to be taken by the Marketplace Business Manager:

- Check of the Service Contracts of the Business Partner has to be performed
- Change of the Business Partner Object in the GeM Marketplace

Check of the Partner Contract between the Business Partner and the GeM Marketplace has to be performed

6.3.21.1 1373 UC Search and Select Business Partner

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.19.1

Scope & Level	Core Service.Find Business Partners that satisfy search criteria.

6.3.21.2 1480 UC Create Service Contract Termination Request

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.12.1

Scope & Level	Core Service A termination of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) makes a termination request on a Service Contract.

6.3.21.3 1376 UC Change Business Partner Account

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.21.3

Scope & Level	Core Service. Data of a Business Partner are changed.

6.3.21.4 1377 UC View Business Partner Account Details

This Use Case is listed before in this Chapter, please refer to paragraph 6.3.21.4

Scope & Level	Core Service.View details of a Business Partner

6.3.21.5 1481 UC Confirm Service Contract Termination

This Use Case is listed before in this Chapter, please refer to 6.3.12.2

Scope & Level	Core Service A termination of a bilateral Service Contract is a two-step process. A Business Partner (Service Provider or Service Requester) accepts or rejects a termination request on a Service Contract made by the other Business Partner.

6.3.21.6 1379 UC Activate Business Partner Account

Scope & Level	Core Service		
Goal in context	The account of a Business Partner is activated.		
Preconditions	Business Partner is **registered and inactivated** at the marketplace		
Successful out-come	The Business Partner is activated in the system at his request.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request not complete	• Display of an error message • Cancellation of the activation request	Request Form is not filled correctly

Primary actor	1355: ACT Business Partner
Secondary actor	1367: ACT Marketplace Business Operator
Main scenario	• Activation Request Form filled and submitted by a representative of the Business Partner. • Activation of the Business Partner in the system by the Marketplace Business Manager. • Notification of the Business Partner
Alternatives	-
Variations	-
Related information	-
Issues	**Access**: Role Based Authorization required **Data Security**: Data Integrity must be guaranteed Data Confidentiality must be ensured **Data Privacy:** Sensitive Data is only stored when needed and authorized Data Export Policy required **Performance**: sub-second response for Service Transactions, incl. Marketplace **Availability**: 24/7 availability required **Scalability**: capable to grow with electro mobility market

6.3.21.7 1380 UC Deactivate Business Partner Account

Scope & Level	Core Service		
Goal in context	The account of a Business Partner is inactivated at the marketplace		
Preconditions	Business Partner is **registered and activated** at the marketplace		
Successful outcome	The Business Partner is inactivated in the system at his request.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Request not complete	• Display of an error message • Cancellation of the change request	Request Form is not filled correctly
	Deactivation not accomplished	• Notification • Cancellation of the deactivation request	Business Partner has active service contracts at the marketplace
Primary actor	1355: ACT Business Partner		
Secondary actor	1367: ACT Marketplace Business Operator		
Main scenario	• Deactivation Request Form filled and submitted by a representative of the Business Partner. • Check of his Service Contracts. • Deactivation of the Business Partner in the system by the Marketplace Business Manager. • Notification of the Business Partner		
Alternatives	-		
Variations	-		
Related information	-		
Issues	**Access**: Role Based Authorization required		

	Data Security:	Data Integrity must be guaranteed Data Confidentiality must be ensured
	Data Privacy:	Sensitive Data is only stored when needed and authorized Data Export Policy required
	Performance:	sub-second response for Service Transactions, incl. Marketplace
	Availability:	24/7 availability required
	Scalability:	capable to grow with electro mobility market

Appendices

A. Definition of Actors

ID	Actor	Description	Full description
1355	ACT Business Partner	Abstract actor representing the service provider as well as the service requester	Any party that is registered at the marketplace acts as Business Partner. They can act as Service Provider and/or as Service Requester. The Business Partner is the parent of all Service Providers and Service Requester.
140	ACT Clearinghouse	authenticates and processes contractual and financial transactions	The Clearing House acts as a roaming enabler. It can collect contractual data either from the marketplace, where the business partners can store their bilateral contracts, or can ask the involved parties by itself. Another option is that the clearing house stores a subset of contract information in its own database. It forwards the CDR to the corresponding EVSP of a customer who has charged at a foreign location. The clearing house does the authentication of charging requests when it is asked by the EVSE operator.
129	ACT DSO Distribution system operator	Provides the power connection point to the charging spot.	Is responsible for the voltage stability in the distribution grid (MV/LV grid). Is in charge of providing the energy metering to other market actors (i.e. EVSP, TSO, EVSE Op.) unless there is another actor doing this (i.e. Metering Point Operator).
1595	ACT Emergency Service Center	Emergency Service Center	Emergency Service Center
130	ACT Energy retailer	Delivers electricity to the charging spot	N/A
143	ACT EV (Electric Vehicle)	Provides access to the vehicle data	The EV has no direct access to the marketplace, only through the systems of an EVSP, e.g. OEM.
1539	ACT EVCC Electric Vehicle Communication Controller	embedded system, within the vehicle, that implements the communication between the vehicle and the SECC in order to support specific functions	N/A

ID	Actor	Description	Full description
131	ACT EVSE (Electric Vehicle Supply Equipment)	Is used to exchange energy between the EV and the Grid. This can be both “slow chargers”, “fast chargers” and “battery switch stations”.	Conductors, including the phase(s), neutral and protective earth conductors, the EV couplers, attached plugs, and all other accessories, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premises wiring to the EV and allowing communication between them as necessary. Relevant Standards: - ISO 61581 series (conductive charging system) - ISO 15118 series (use cases, connectivity, identification)
132	ACT EVSE Operator	in charge of managing the EVSEs	N/A
1406	ACT EVSE Operator Backend	Backend, administrative systems of the EVSE Operator, as opposed to frontend, on-site systems that communicate directly with EV’s	N/A
128	ACT EVSP (Electric Vehicle Service Provider)	offers e-mobility services to the end customers	Legal entity that the customer has a contract with for all services related to the EV operation.
1407	ACT EVSP Backend	Backend, administrative systems of the EVSP	N/A
1594	ACT Fleet manager	Organization that manages a fleet of EV's	Can be a part of an EVSP, an OEM, or any other party in the EV market.
1540	ACT HMI Human Machine Interface	interface allowing the vehicle user to receive information relative to the charging process and provide input to the charging system	N/A
1367	ACT Marketplace Business Operator	A special kind of the Marketplace Operator role	The Marketplace Business Operator is a Marketplace Operator with the focus on the business of the marketplace The Marketplace Operator is the parent of the Marketplace Business Operator
136	ACT Marketplace Operator	Operates the platform and communications, and manages access to and working of the marketplace	Large and Trusted ICT-service provider

ID	Actor	Description	Full description
1402	ACT Marketplace Technical Operator	A special kind of the Marketplace Operator role	The Marketplace Technical Operator is a Marketplace Operator with the focus on the technical aspects of the marketplace The Marketplace Operator is the parent of the Marketplace Technical Operator
134	ACT OEM	Manufacturers of electric vehicles and charging equipment	The ACT OEM subsumes the provision of equipment to the end-users whereas "equipment" is related to an electric vehicle and eventually the charging equipment (EVSE) e.g. for charging at home, often called as "wallbox". Together with the provision of the vehicle (sale, leasing or other forms of mobility services not related to electric mobility) the OEM may offer additional services in the field of navigation, information and maintenance services. This requires a communication to the vehicle (depending on the connectivity options of the vehicle, refer to FTR 1300 for more details) and the existence of a corresponding IT backend of the OEM. The Provision of e-mobility services is not covered by the role of the ACT OEM; in this case the OEM acts in addition as an E-Mobility Service Provider.
135	ACT Public sector	EU commission, National government, local government, municipalities	Public sector needs information about the added value of e-mobility to the society, environmental footprint, and the need for new infrastructure (inputs for planning)
1541	ACT SECC Supply Equipment Communication Controller	implements the communication to one or multiple EVSEs	May be able to interact with secondary actors
137	ACT Service Provider	Business Partner that offers and sells EV Services on the marketplace	Sells EV Services on the marketplace Are there any criteria of Business Partner to become a Service Provider? Who performs an approval of any criteria? Child of the Business Partner
138	ACT Service Requester	Business Partner that consumes EV Services on the Marketplace	Uses the Marketplace to (buy and re)sell EV services to their customers. Child of the Business Partner

ID	Actor	Description	Full description
1579	ACT Third Party Service Provider	An actor which provides access to third party data	The Third Party Service Provider is not connected to the market place directly, but with one or more Service Providers that do act on the Marketplace. Third party Services may include complex interaction with the outside world, or may be as simple as supplying specific data such as timetables of public traffic, tourist information or weather forecast. A Third Party Service Provider has a contract with a Service Provider.
133	ACT Vehicle Driver	Human, currently driving the Vehicle	
1689	Consumer		Its main goal is to consume electricity and, to that end, it is willing to pay for it.
1695	DSO		Maintains the distribution system security.
1696	EcoGrid Consumer		Being a consumer, its goal is to consume electricity. Nevertheless, it has an additional goal which is to alter its power exchange with the electricity network (automatically or by hand) in order to 1) consume less and/or produce more electricity during high-priced periods and 2) consume more and/or produce less electricity during low-priced periods. To that end, it receives real-time price signals from the TSO or the DSO.
1691	Market Operator		It manages the wholesale electricity market, by receiving purchase offers and selling bids from retailers and producers. It matches them and calculates the market clearing price.
1692	Producer		The producers aim is to sell its electricity production and make a profit out of it. It is assumed that electricity is sold through the wholesale market. Any difference between the sold electricity amount and actual generation must be balanced by the TSO, so the producer will need to pay for those imbalances.
1693	Production BRP		It is responsible for keeping the schedule sent to the TSO for all its producer portfolio and, if not, it is responsible for paying the resulting imbalances.

ID	Actor	Description	Full description
1690	Retailer		The retailer supplies consumers with electricity. To that end, it buys electricity in the wholesale market and sells it to consumers. In addition, the retailer, on behalf of consumers, buys grid access from the DSO and system services from the TSO. Any difference between the purchased electricity amount and actual consumption by consumers must be balanced by the TSO, so the retailer will need to pay for those imbalances. For this model, the retailer will also take the BRP role, so it will be responsible for keeping the schedule sent to the TSO and for paying the resulting imbalances. In addition, the retailer will also act as an aggregator of balancing to be provided by EcoGrid consumers, since it will be the actor acting as the spokesman of consumers with the TSO. If, as a consequence of the prices sent in the real-time market, the retailer is out of balance, the TSO must take into account that such imbalance is not a result of a bad behavior, but a result of a balancing provision.
1694	TSO		Maintains the system-wide balance of the electricity system. As part of this task, the TSO runs the balancing market. In doing so, the TSO is an intermediary between market parties causing imbalance and parties able to deliver the flexibility to solve this imbalance situation. The TSO contacts balancing capacity reserves from producers, which are paid for through system services, and activates them in real-time. However, the TSO may seek for more cost-efficient resources by sending real-time price signals to EcoGrid consumers. In that case, the TSO would be taking the Real-time market operator (RTMO) role and the prices sent to EcoGrid consumers will be based on the need for up- or down-regulation due to occurring imbalance between production and consumption and/or restrictions in the transmission system.

B. Business Process Diagrams

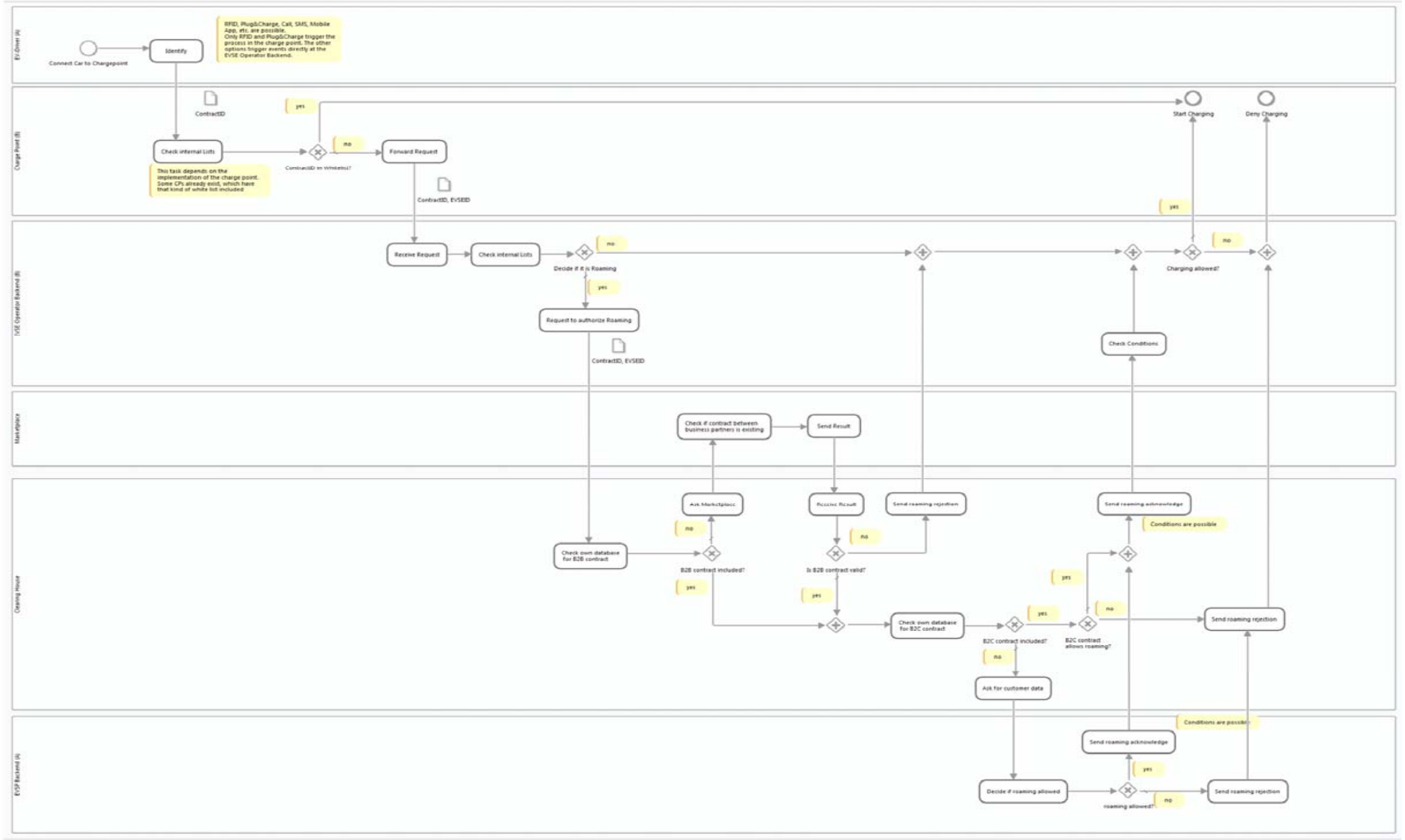
- 1270 BPD Contractual Clearing - Authorization
- 1452 BPD Contractual Clearing - CDR Forwarding

- 1441 BPD General Selling Buying Process
- 1456 BPD Use of Services
- 1431 BPD Contracting Service
- 1495 BPD Service Detail Records for Accounting and Billing
- 1410 BPD Define and Register Service Contract Offering
- 1426 BPD Change or terminate a Service Contract
- 1427 BPD Prolong Service Contract
- 1428 BPD Enable/Disable Service permanently
- 1387 BPD Service Registration
- 1429 BPD Delete Service
- 1271 BPD Propose Standard Interface
- 1363 BPD B2B Partner Management - Create Business Partner Account
- 1371 BPD B2B Partner Management - Change Business Partner Account
- 1382 BPD B2B Partner Management - Activate Business Partner Account
- 1403 BPD B2B Partner Management - Inactivate Business Partner Account

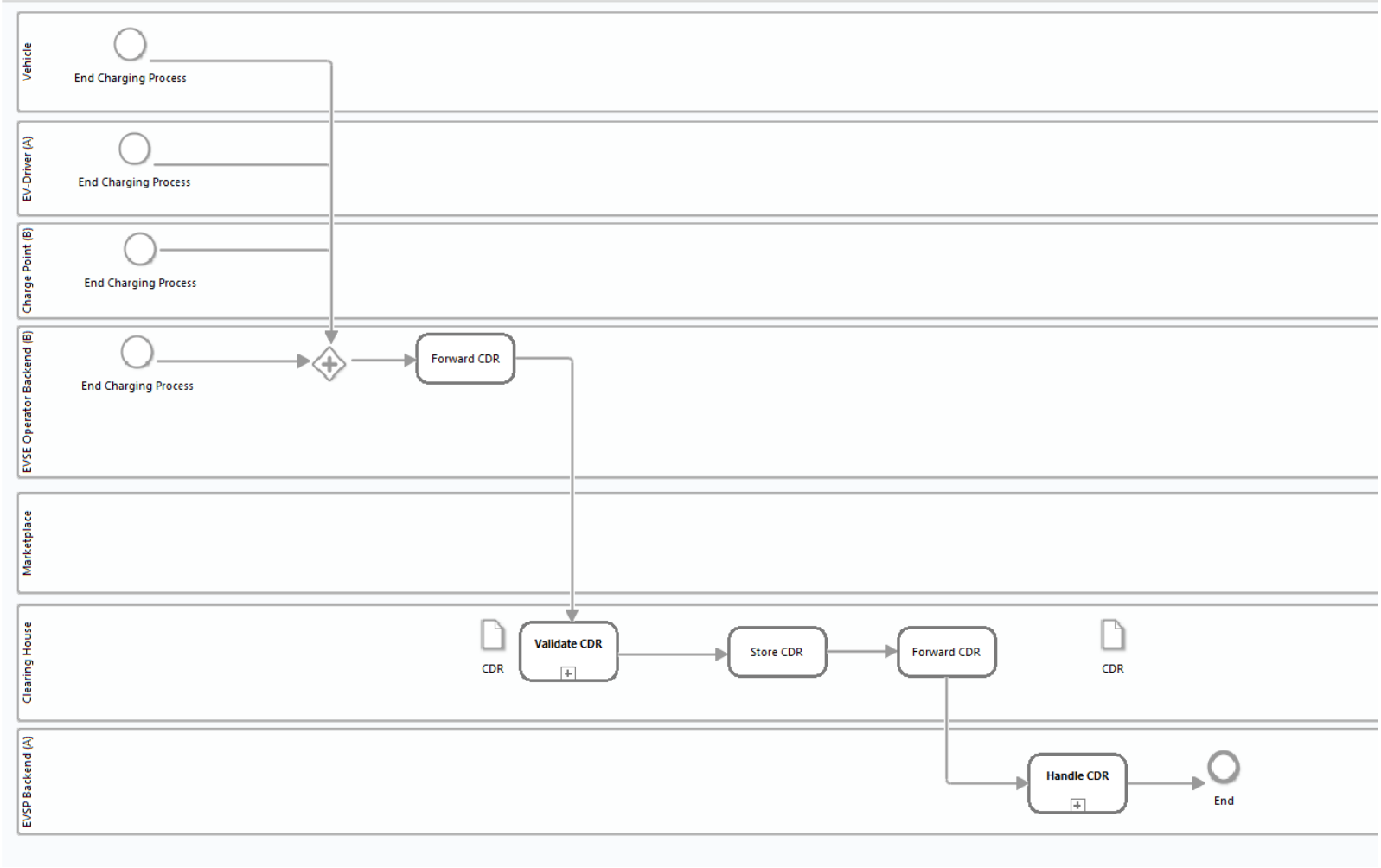
- 1186 BPD Centralized Congestion Management
- 1198 BPD Congestion Management through TOU Tariffs
- 1199 BPD Distributed Congestion Management
- 1200 BPD Enhanced charging

All Business Process Diagrams are created out of the RRC Tool.

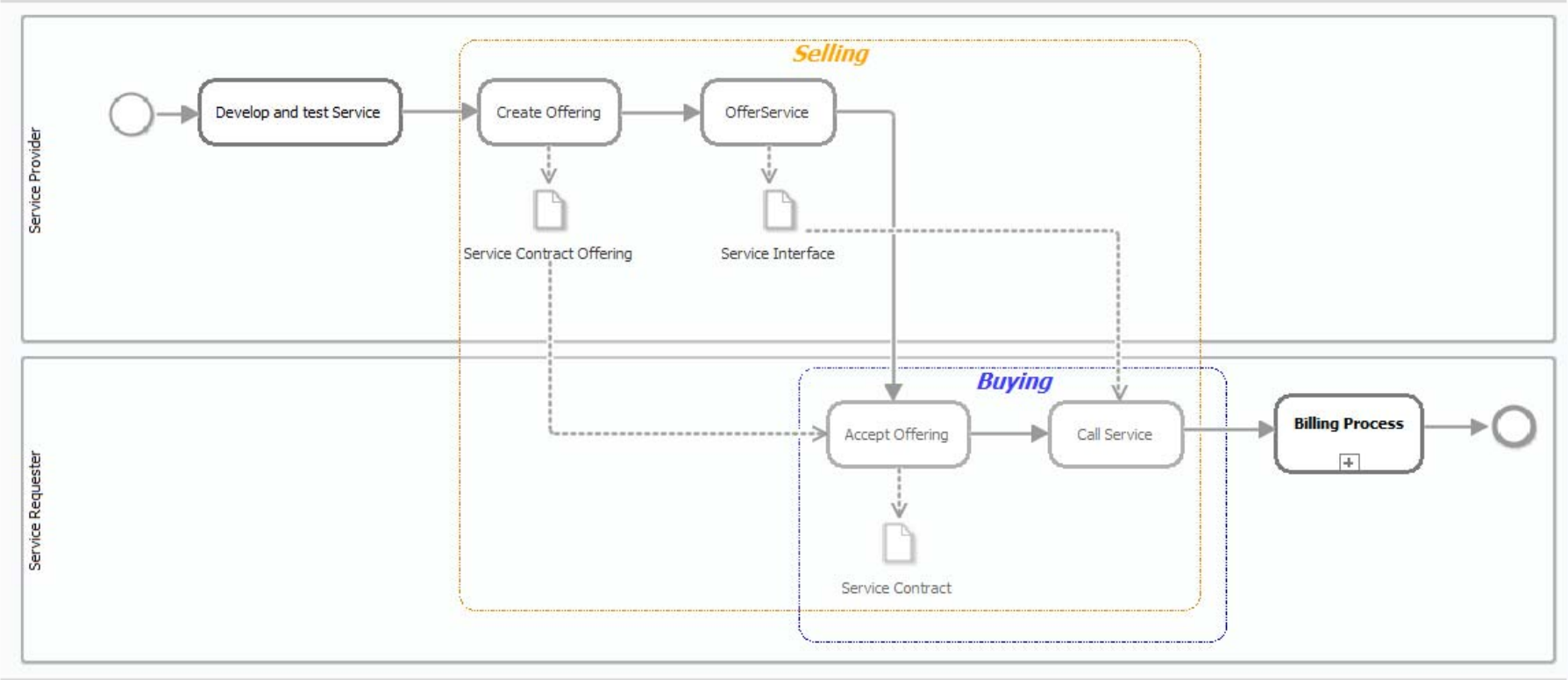
1270 BPD Contractual Clearing - Authorization



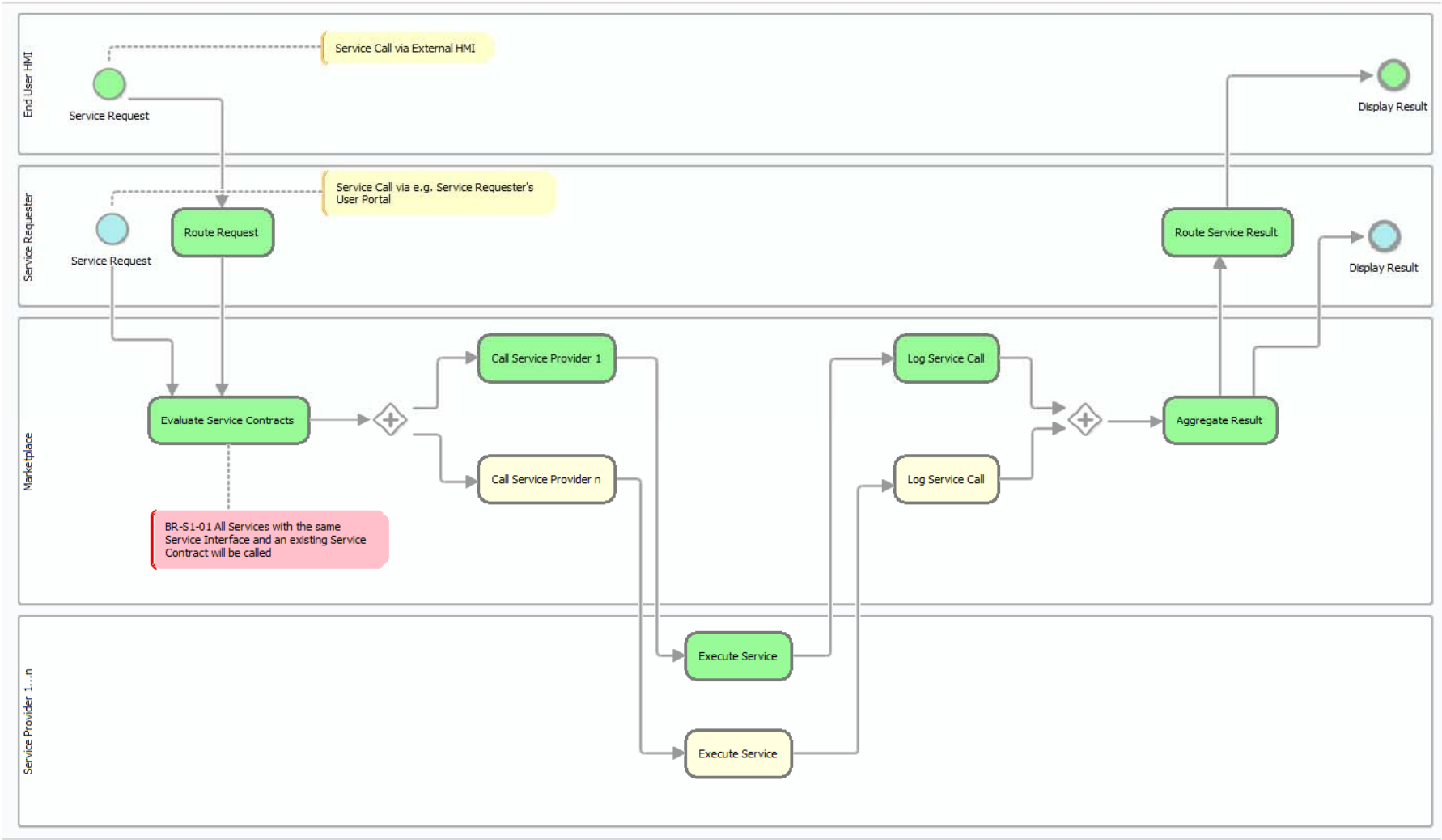
1452 BPD Contractual Clearing - CDR Forwarding



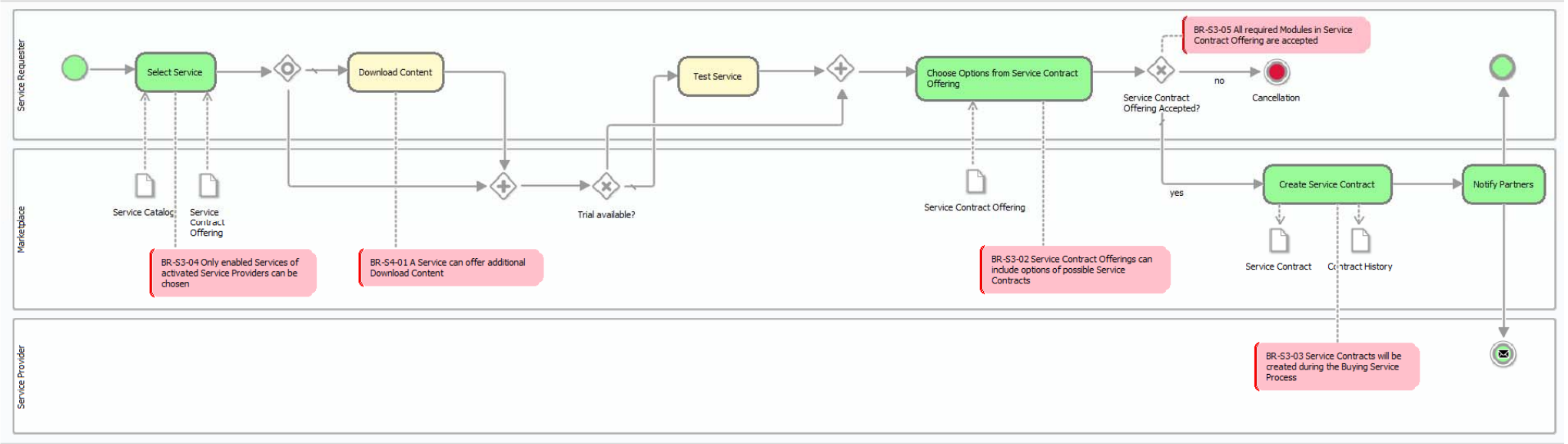
1441 BPD General Selling Buying Process



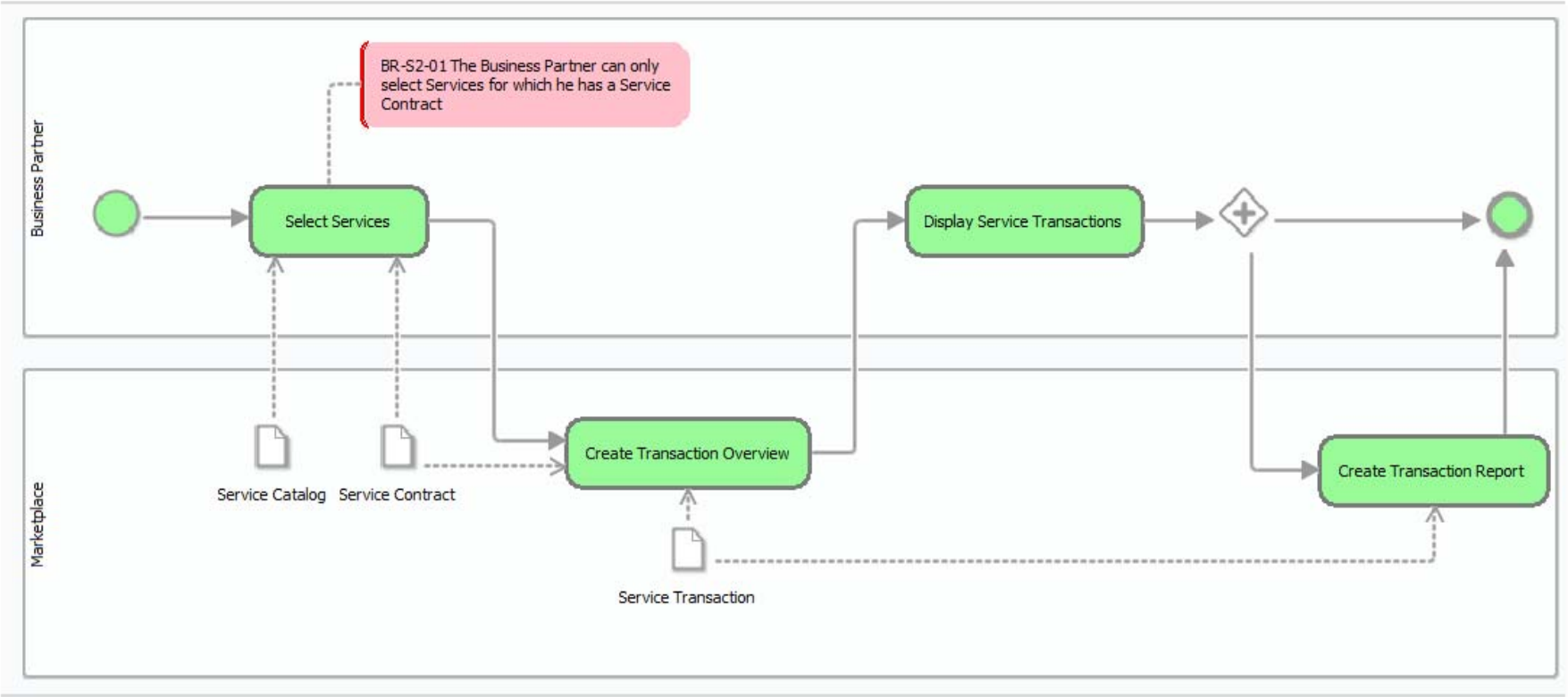
1456 BPD Use of Services



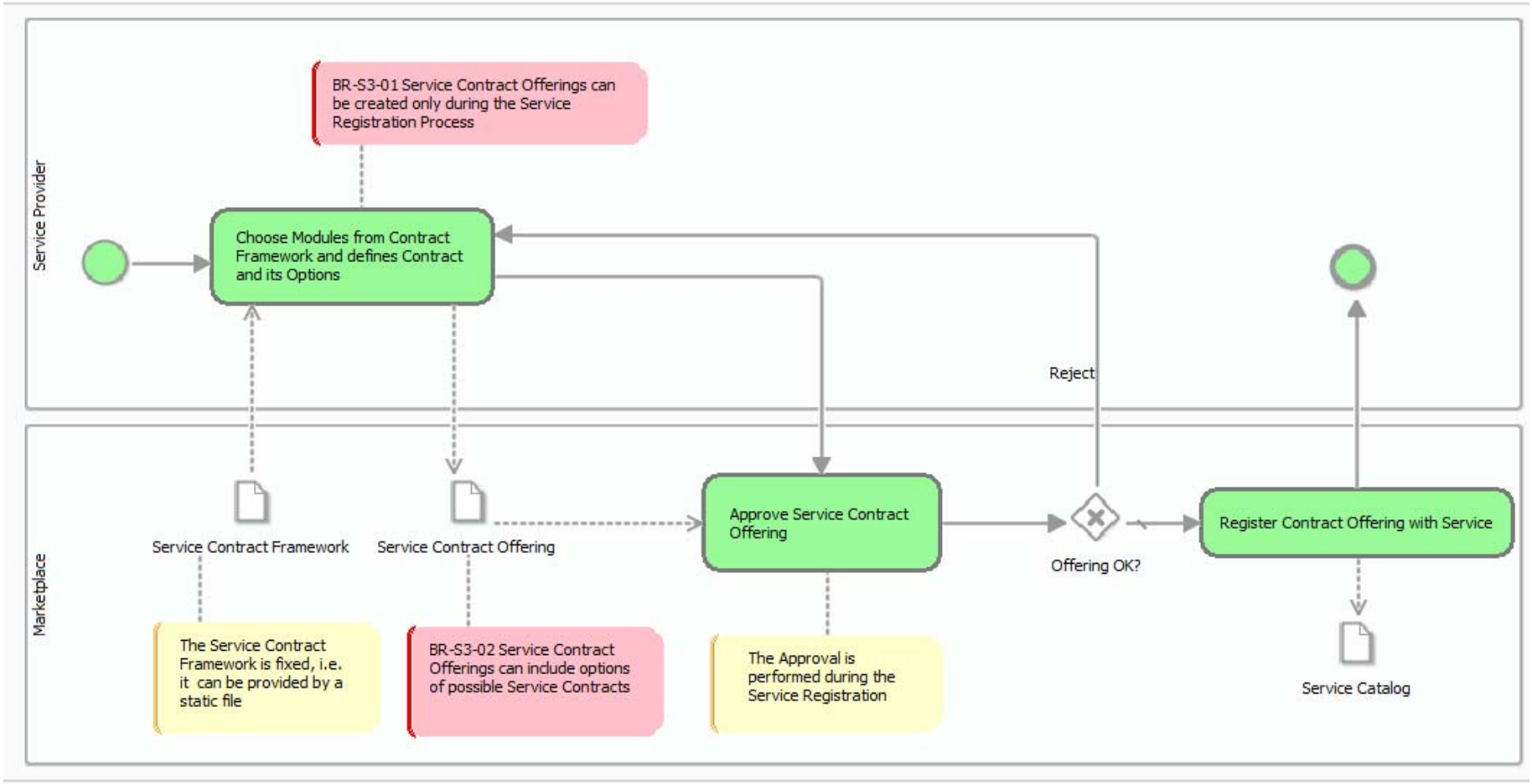
1431 BPD Contracting Service



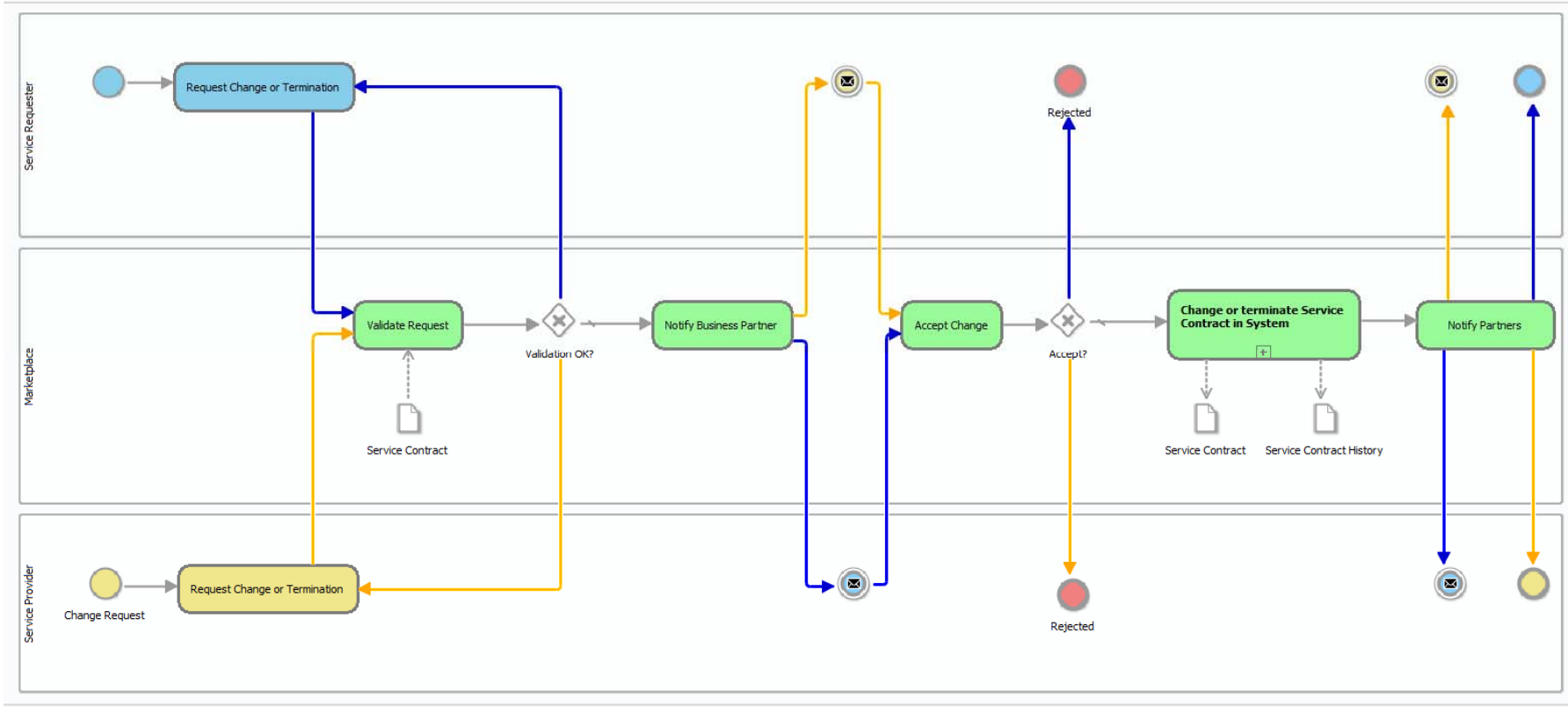
1495 BPD Service Detail Records for Accounting and Billing



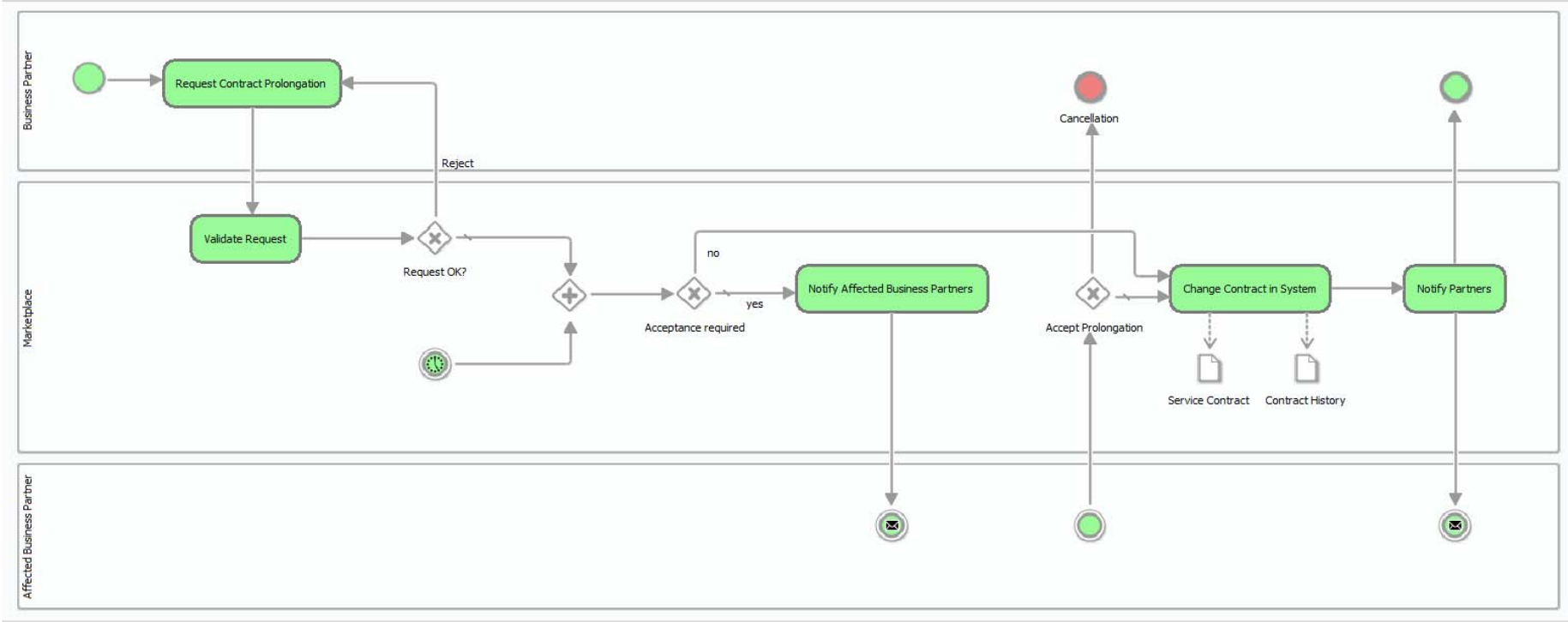
1410 BPD Define and Register Service Contract Offering



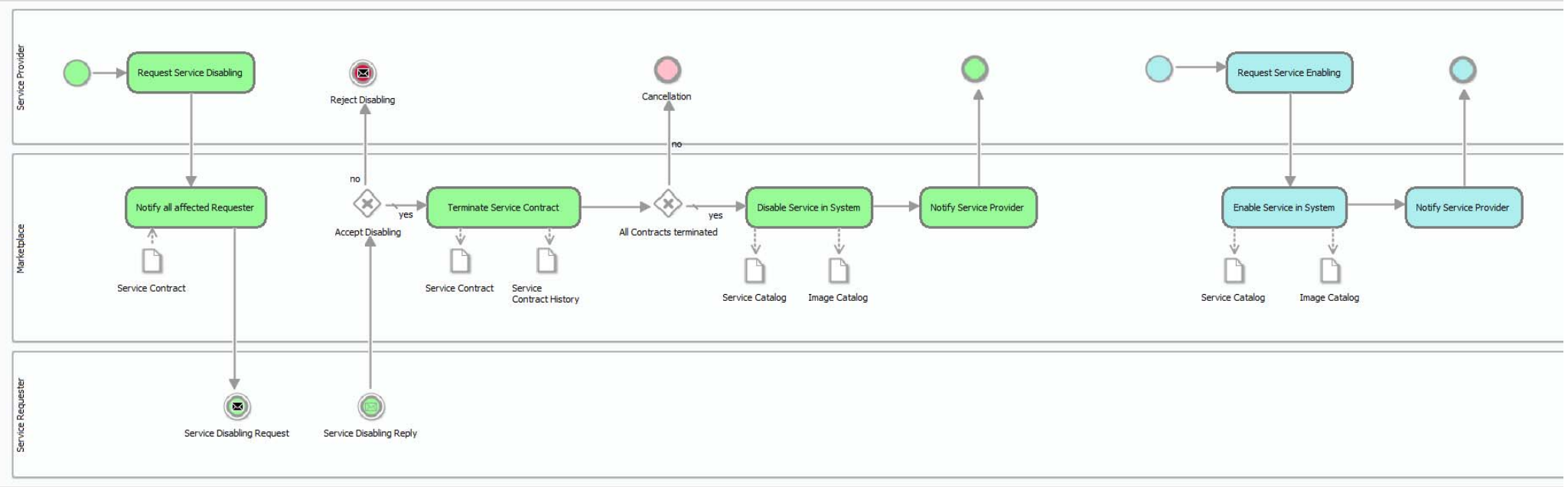
1426 BPD Change or terminate a Service Contract



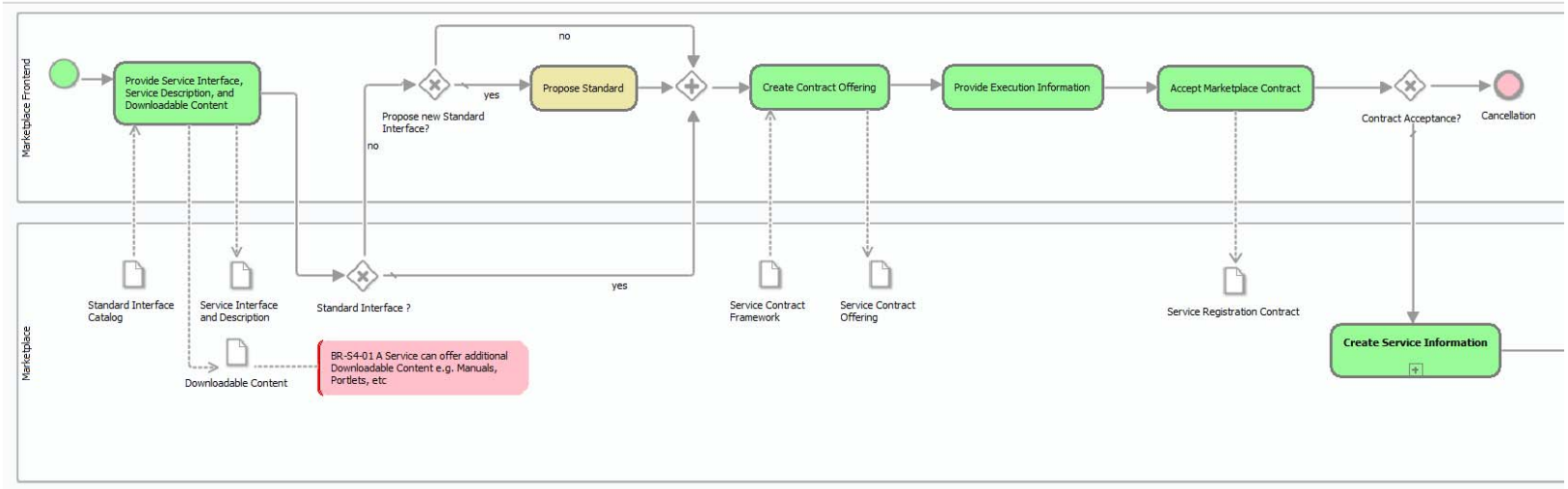
1427 BPD Prolong Service Contract

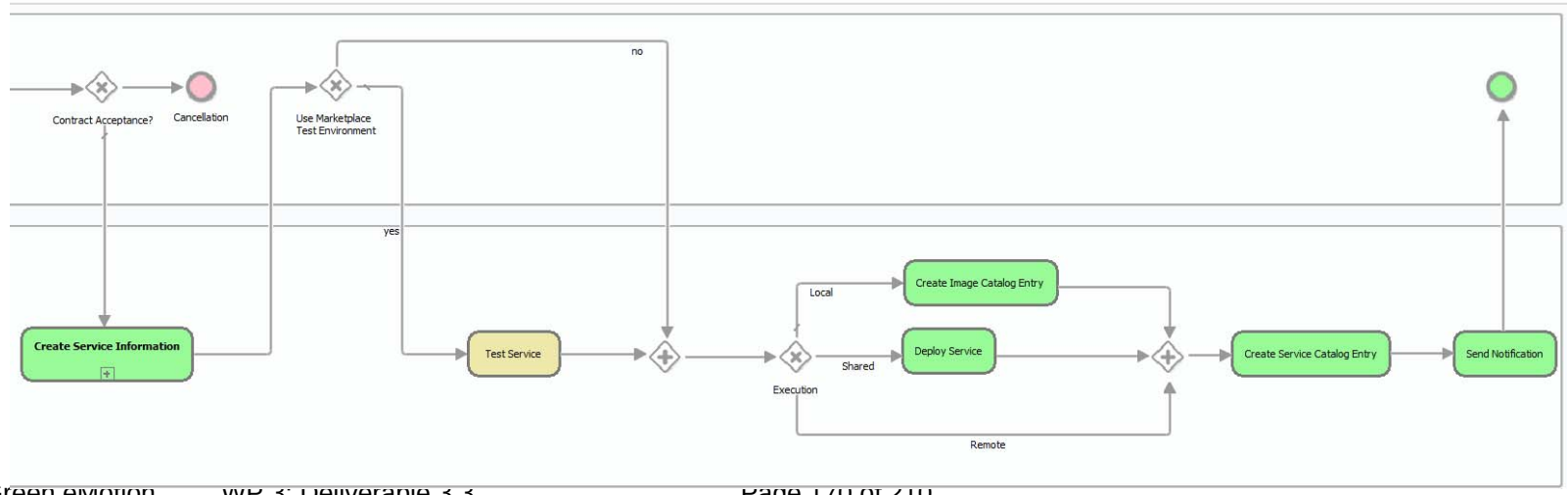


1428 BPD Enable/Disable Service permanently

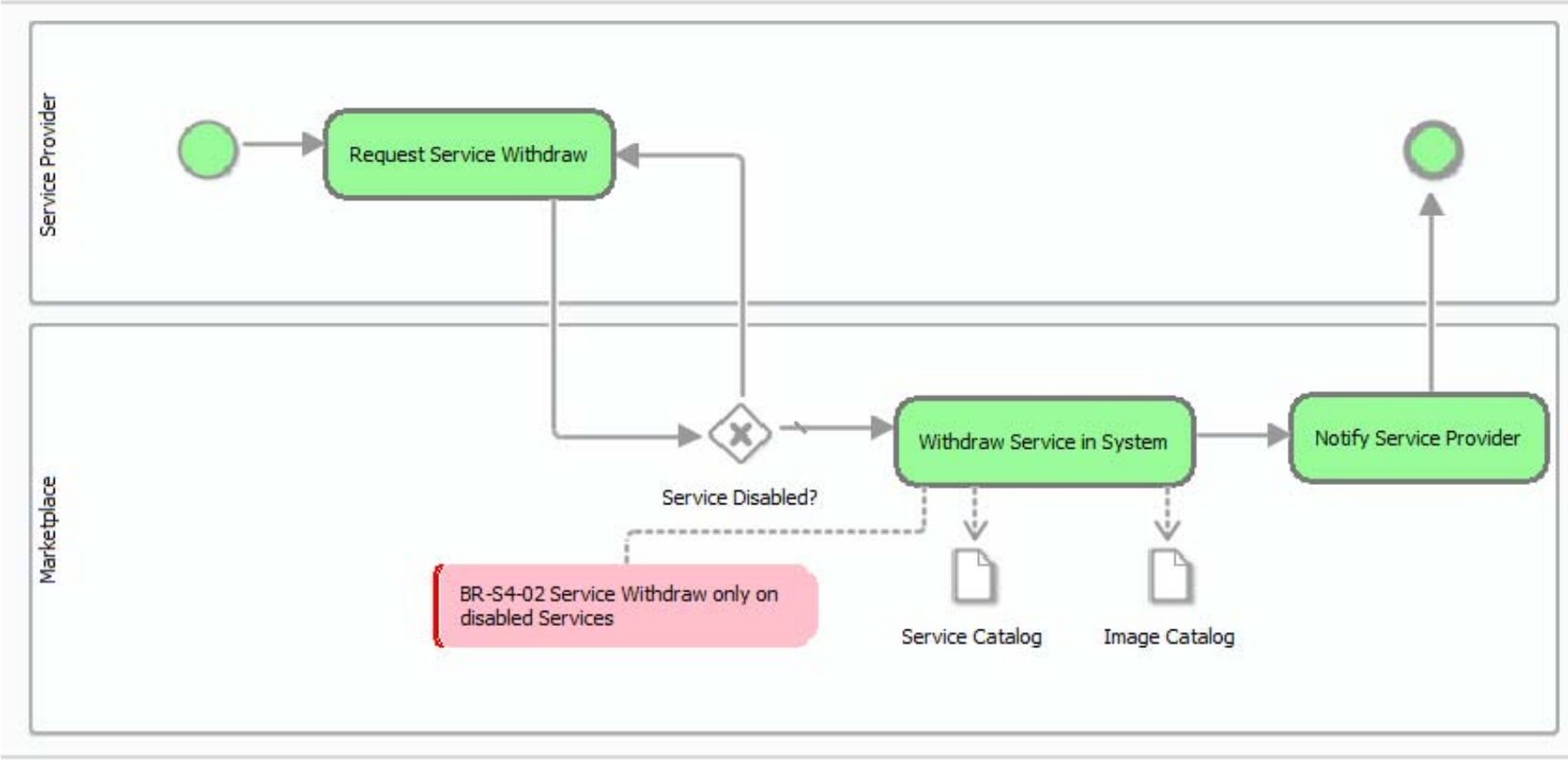


1387 BPD Service Registration

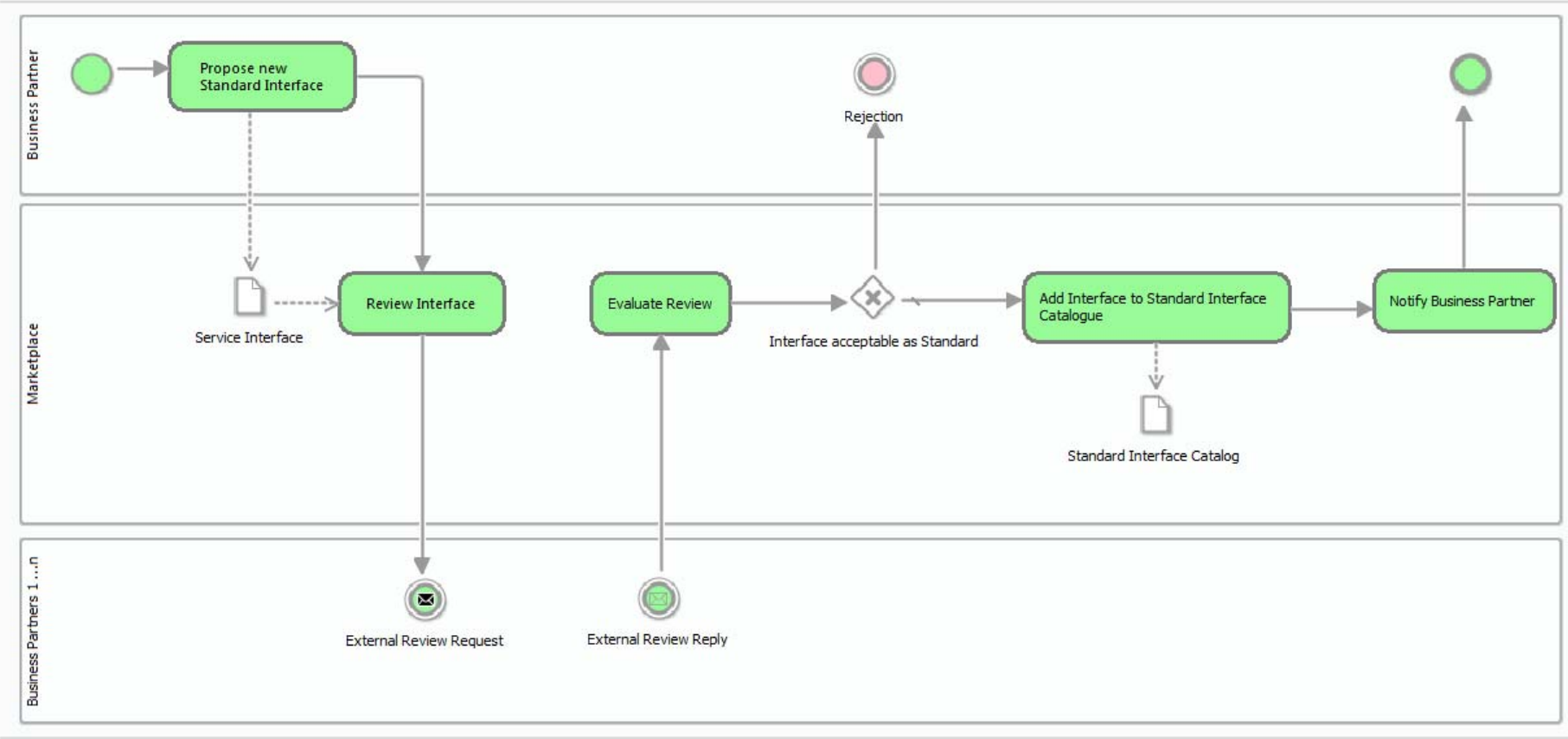




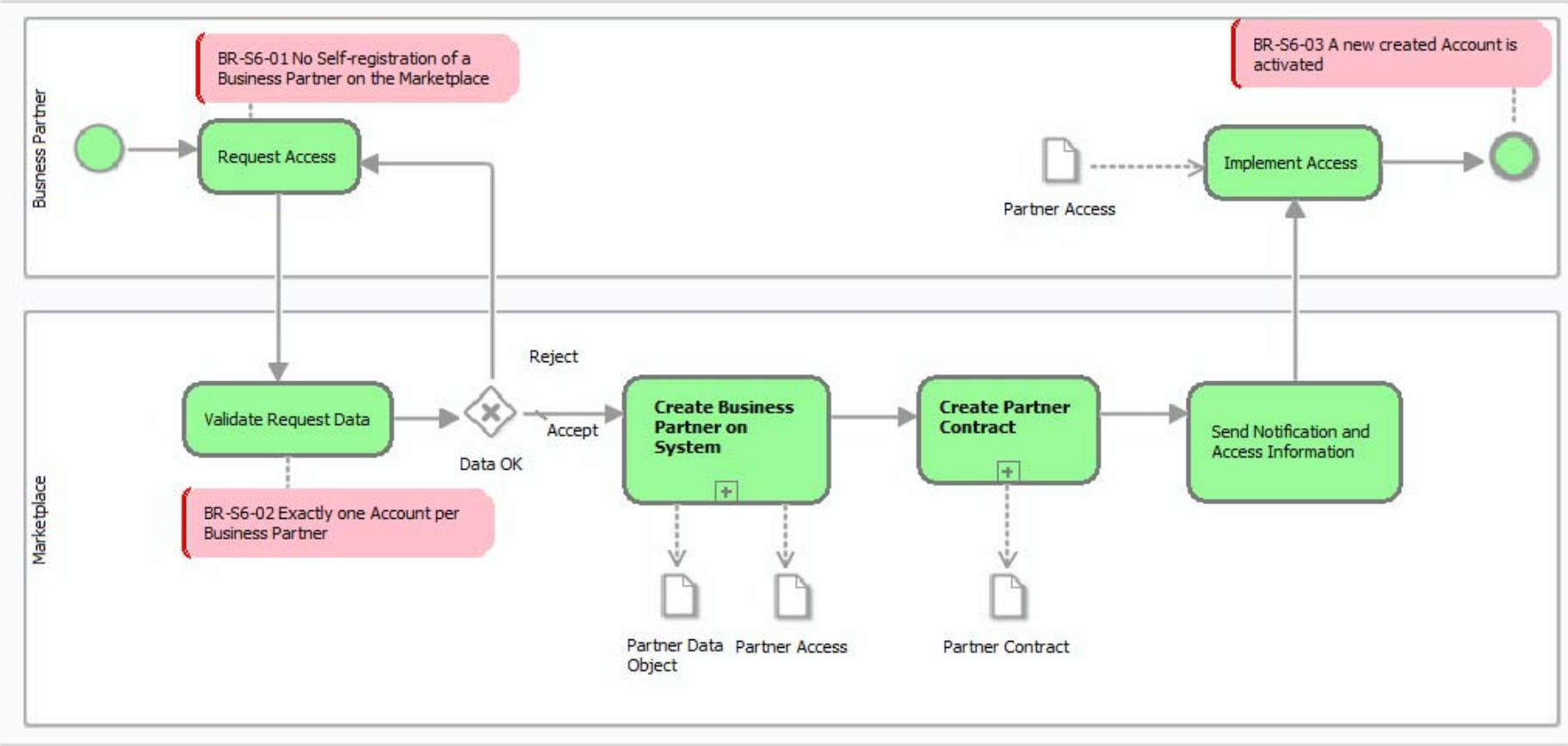
1429 BPD Delete Service



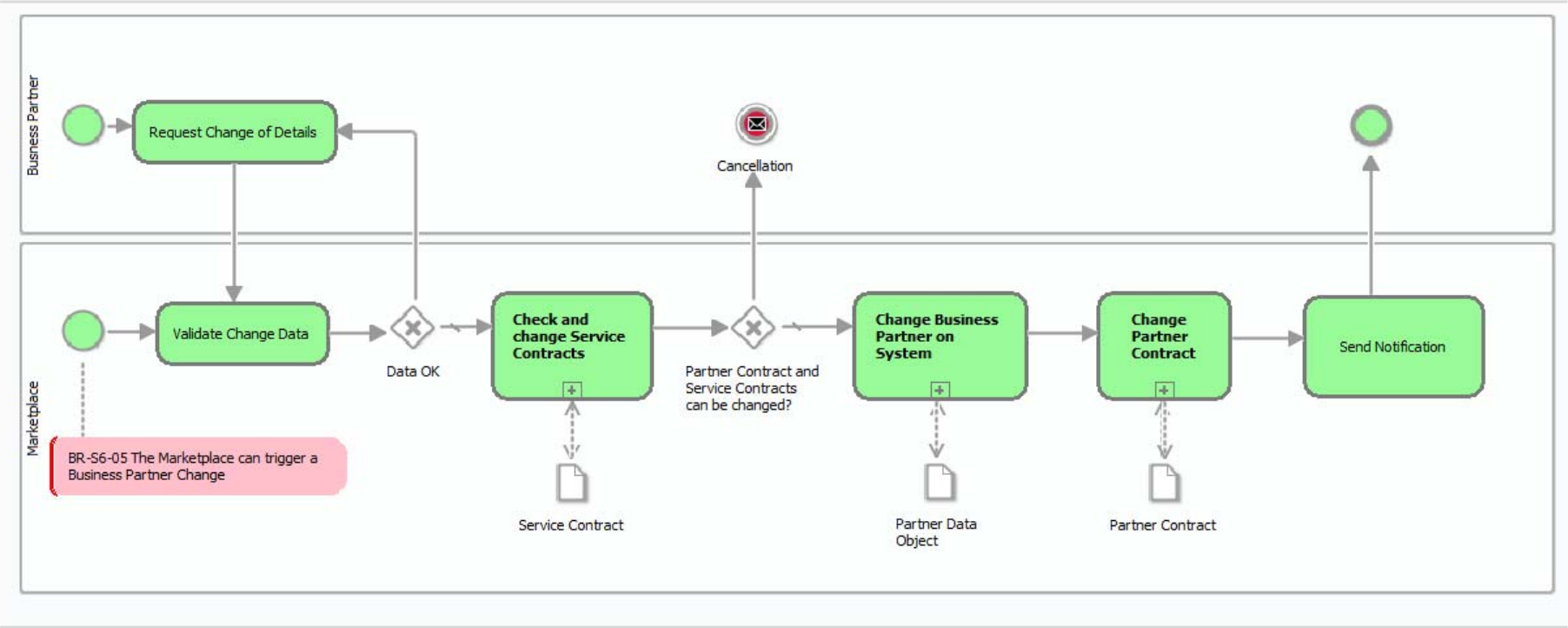
1271 BPD Propose Standard Interface



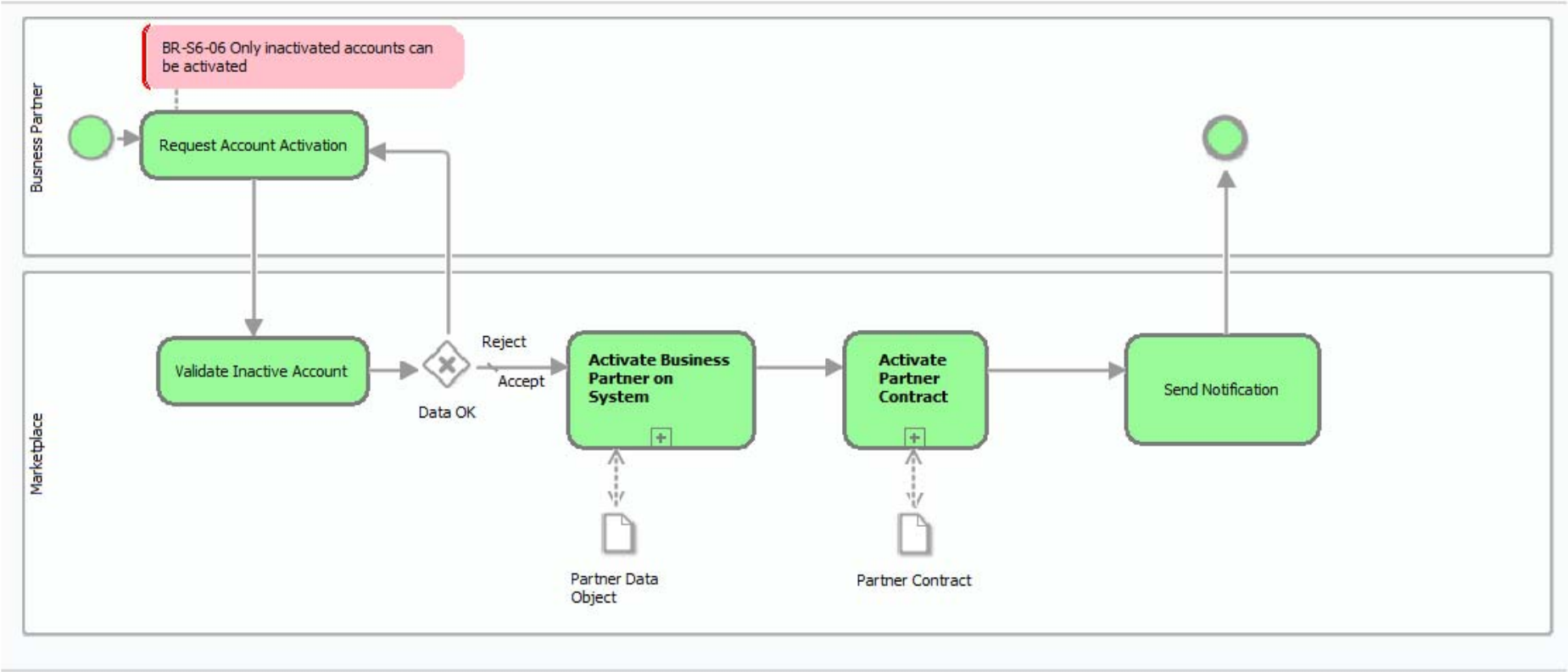
1363 BPD B2B Partner Management - Create Business Partner Account



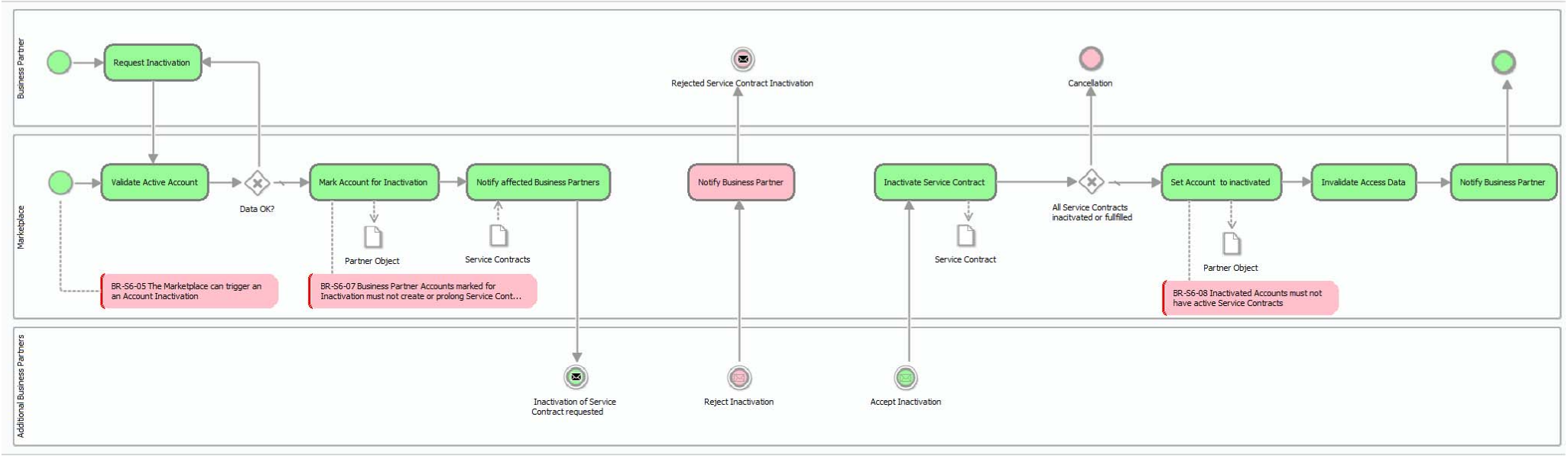
1371 BPD B2B Partner Management - Change Business Partner Account



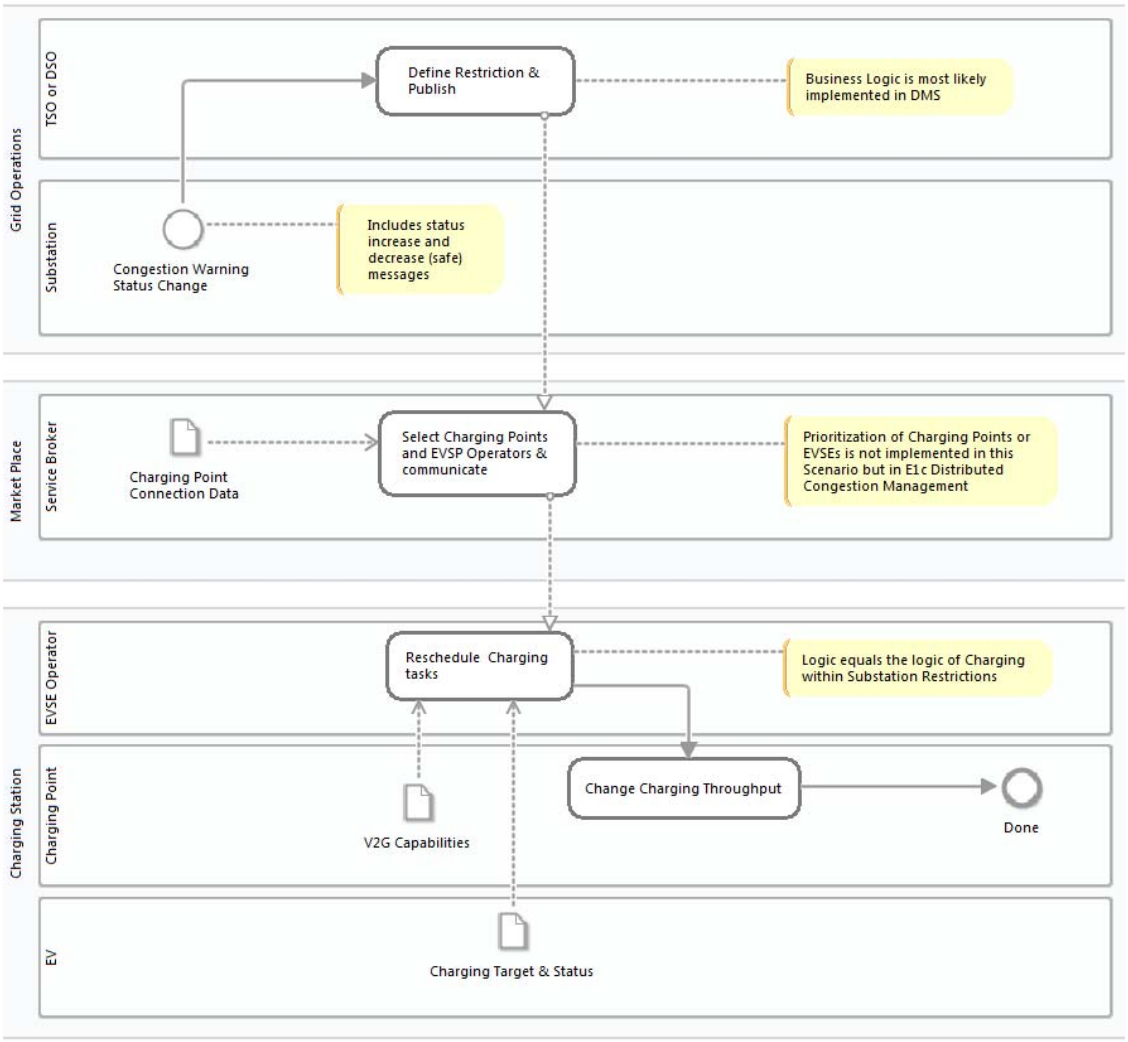
1382 BPD B2B Partner Management - Activate Business Partner Account



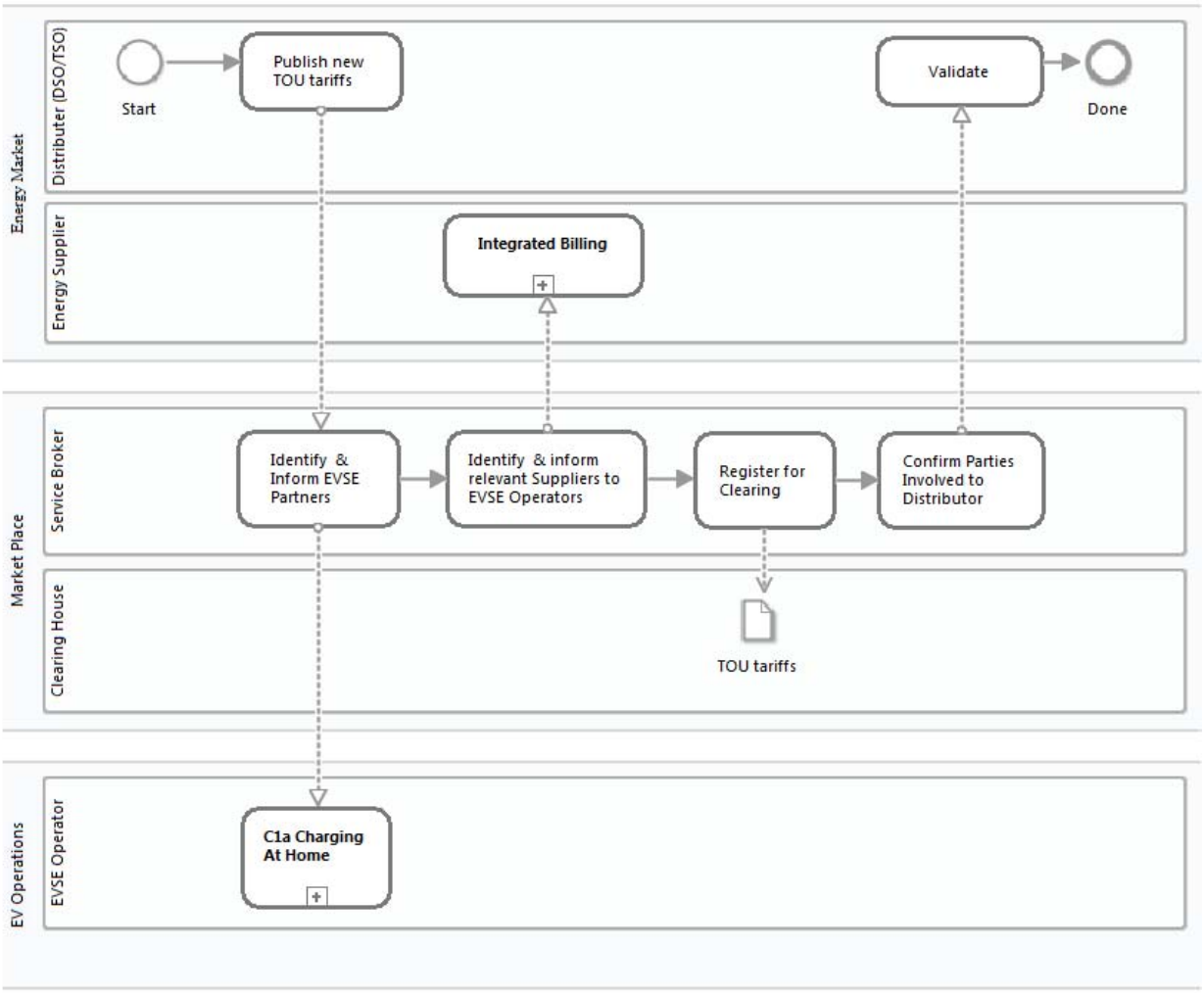
1403 BPD B2B Partner Management - Inactivate Business Partner Account



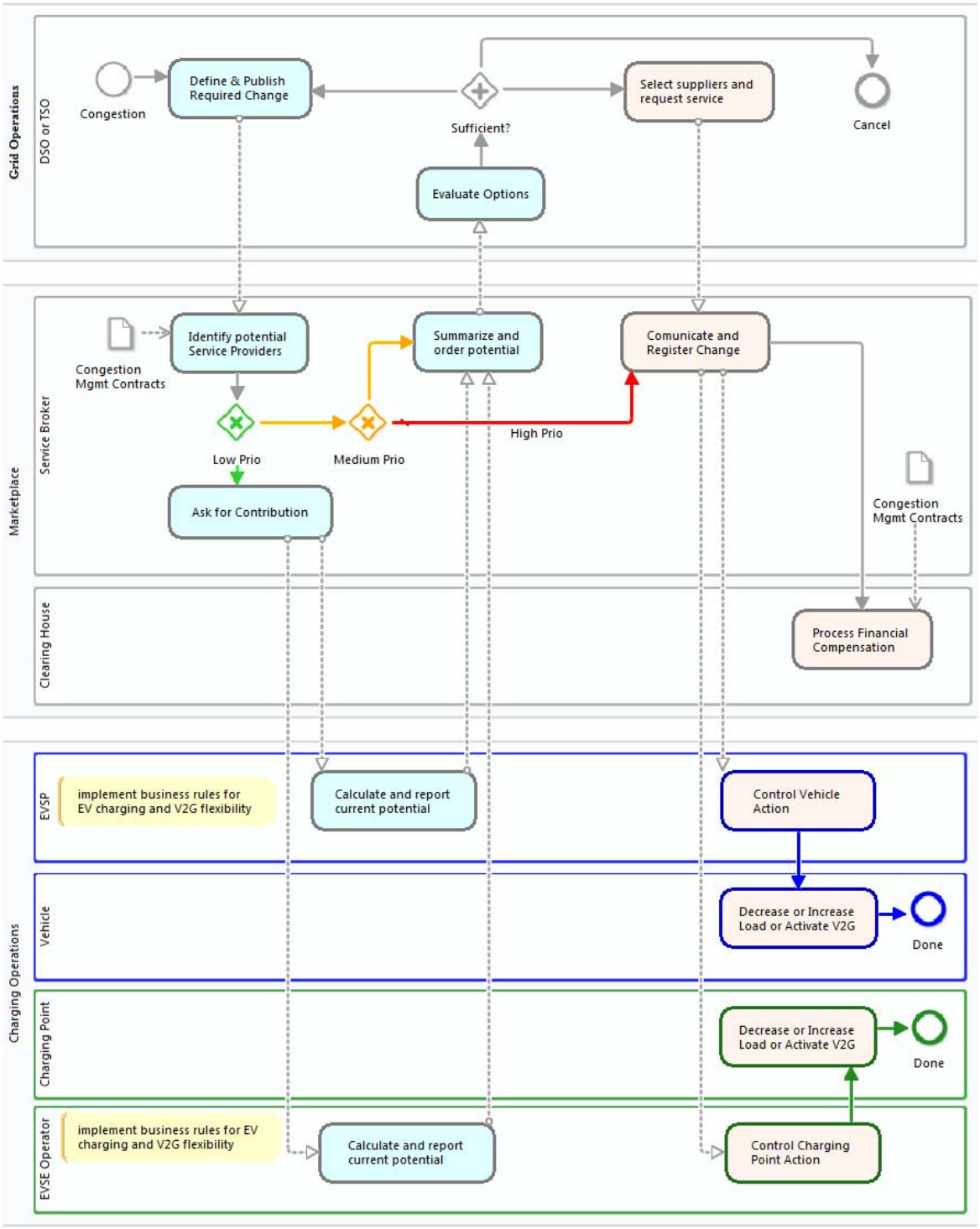
1186 BPD Centralized Congestion Management



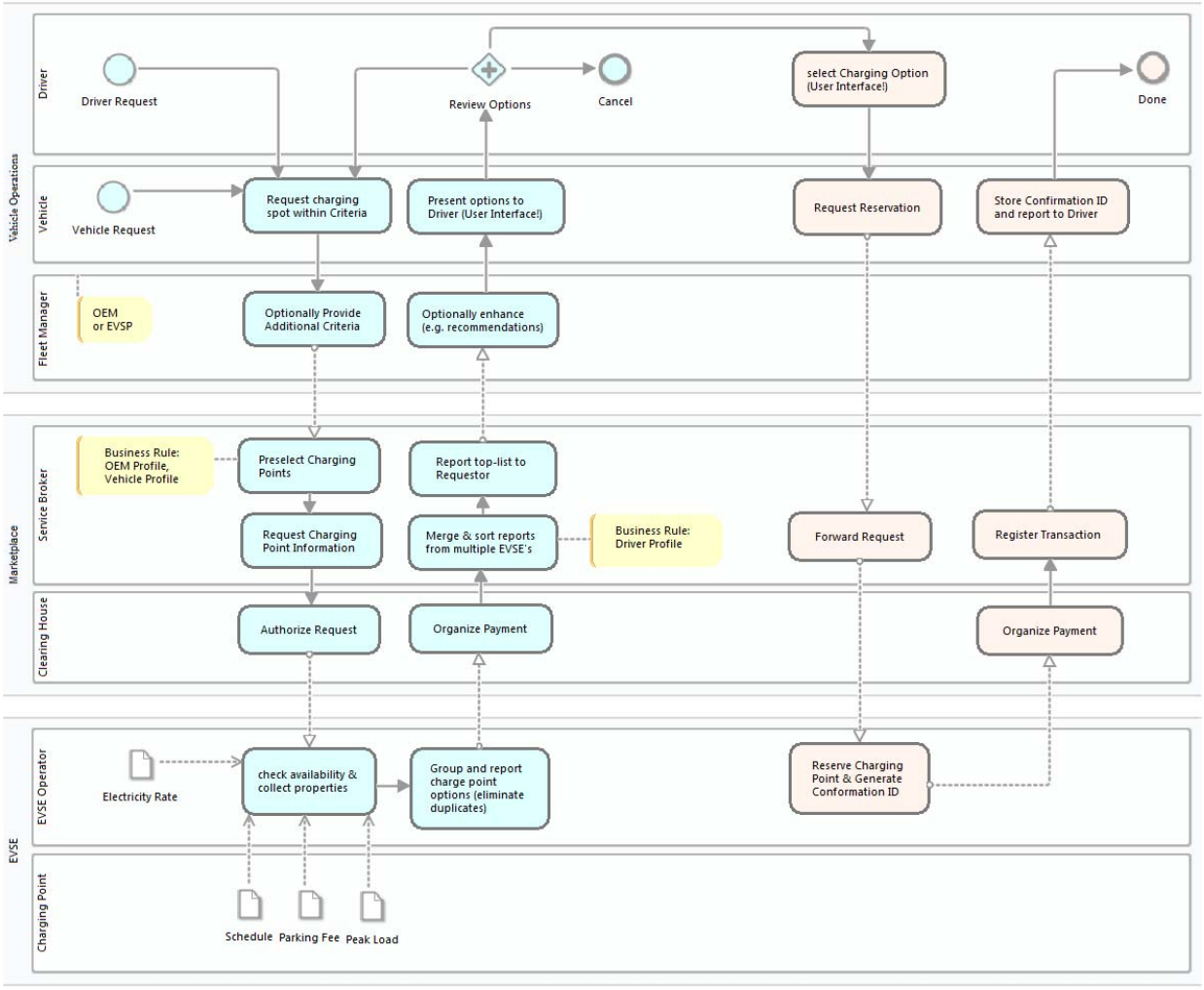
1198 BPD Congestion Management through TOU Tariffs



1199 BPD Distributed Congestion Management



1200 BPD Enhanced charging



C. Use Case Illustrations

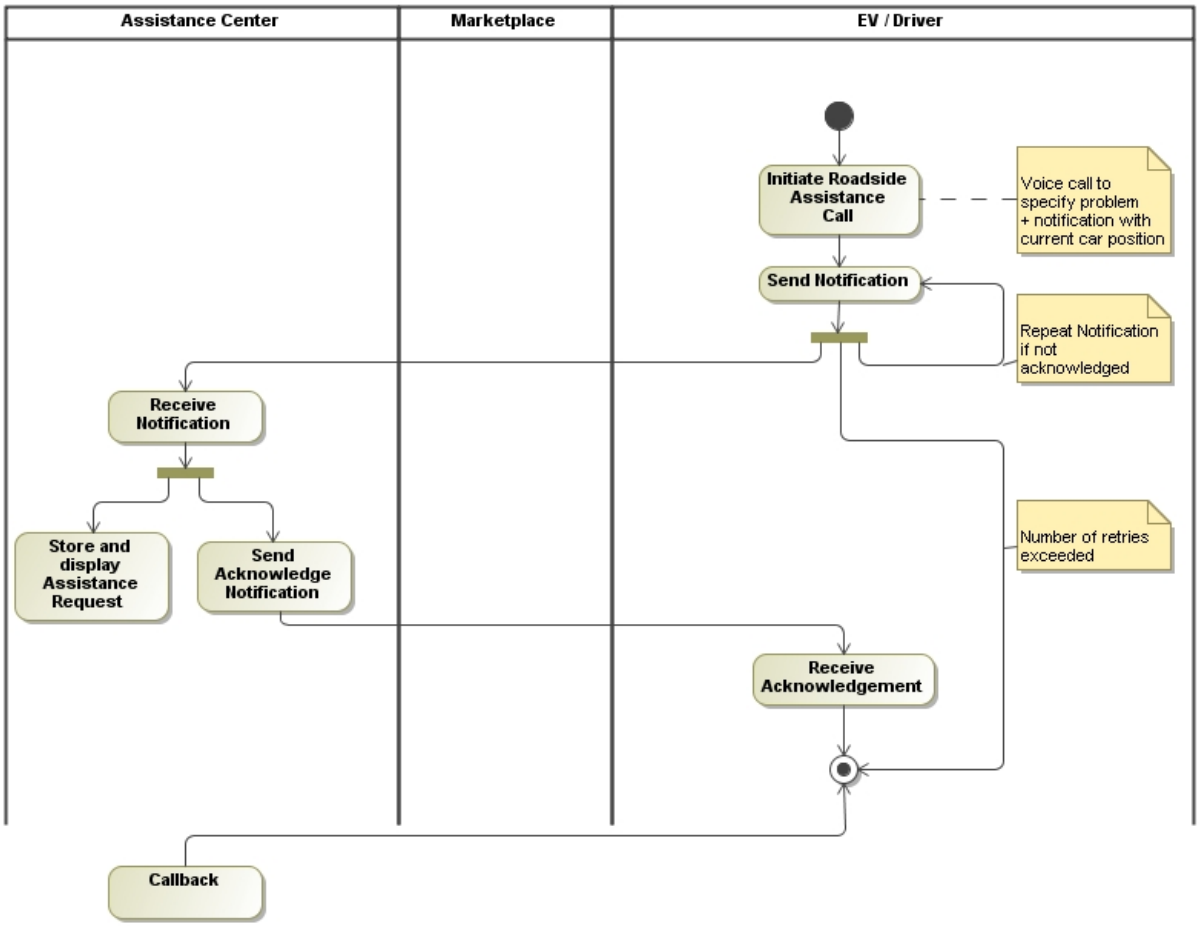


Figure 23 Call for Roadside Assistance

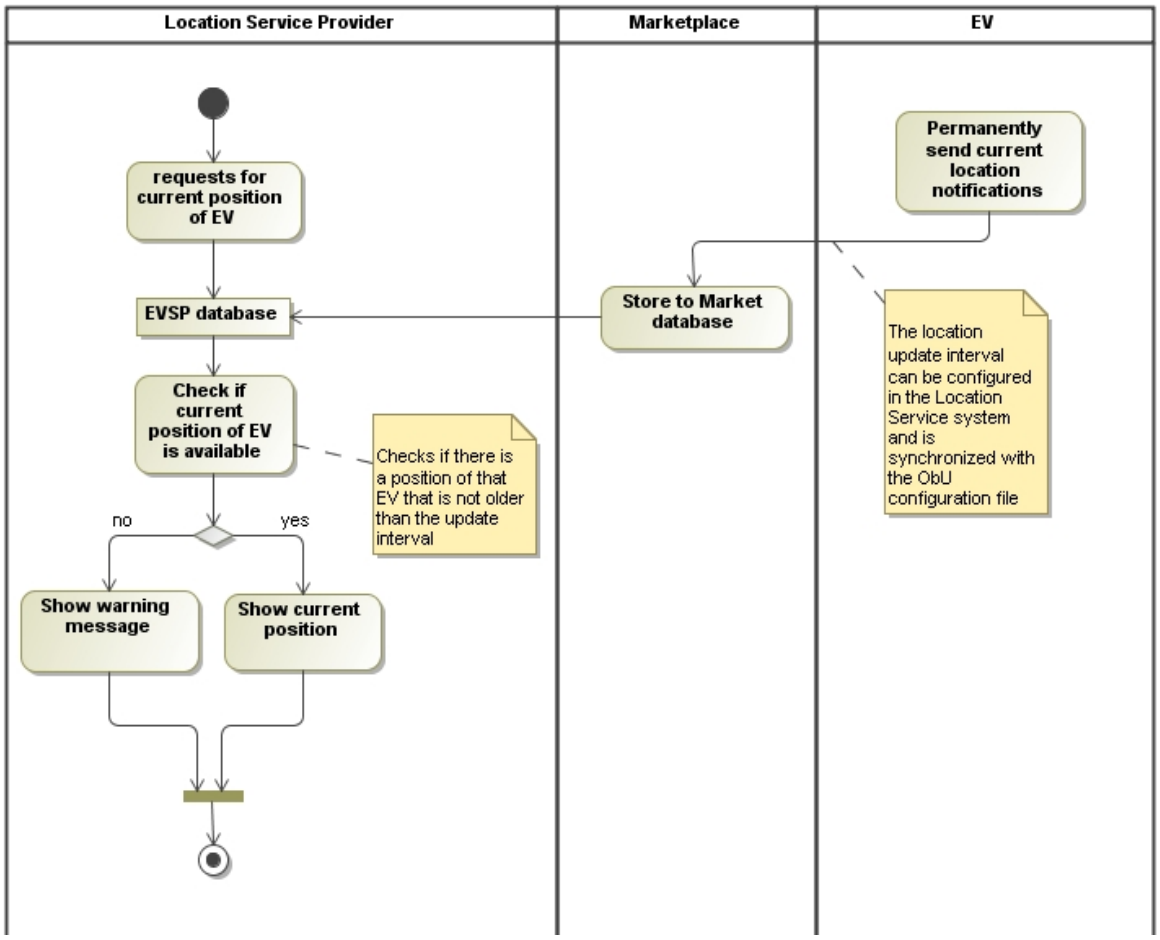


Figure 24 Get Current Position

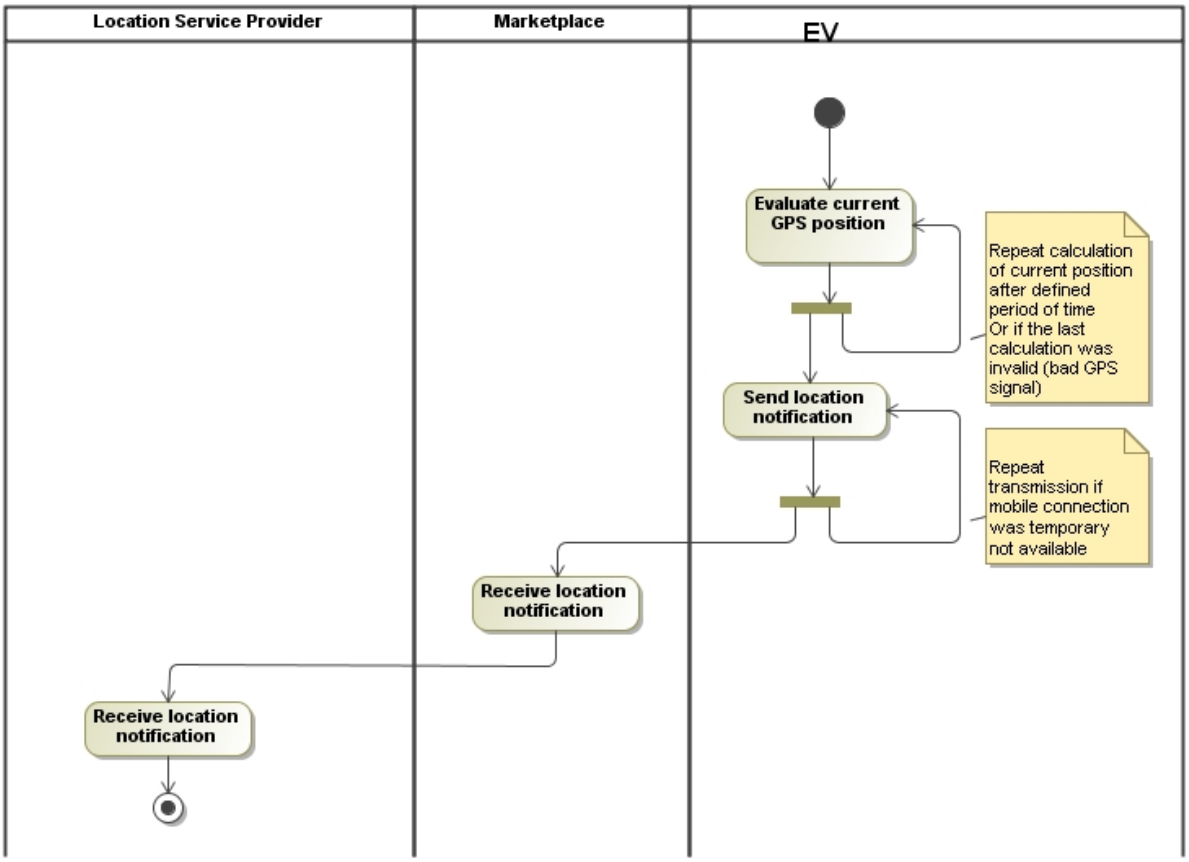


Figure 25 Send Current Position

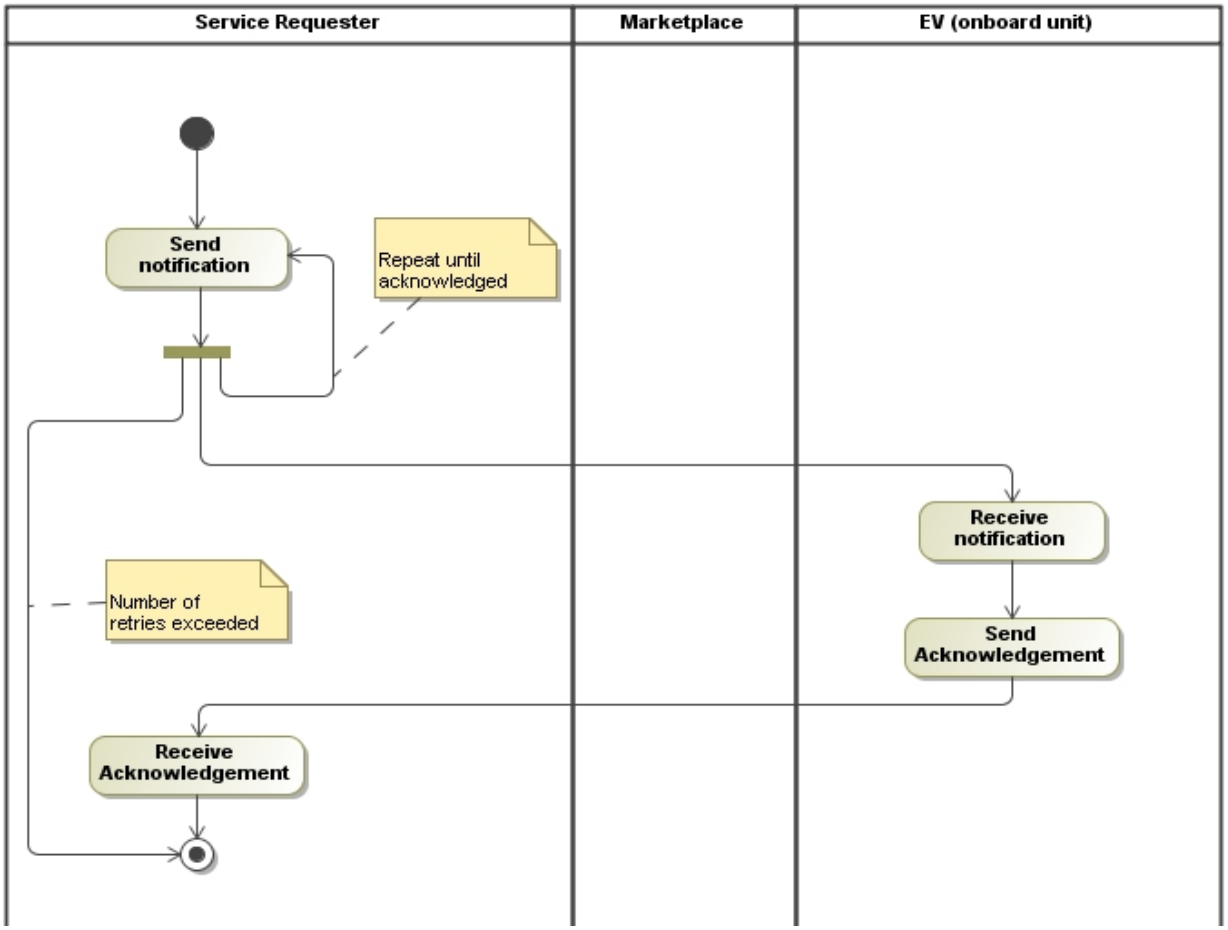


Figure 26 Send Notification M2V

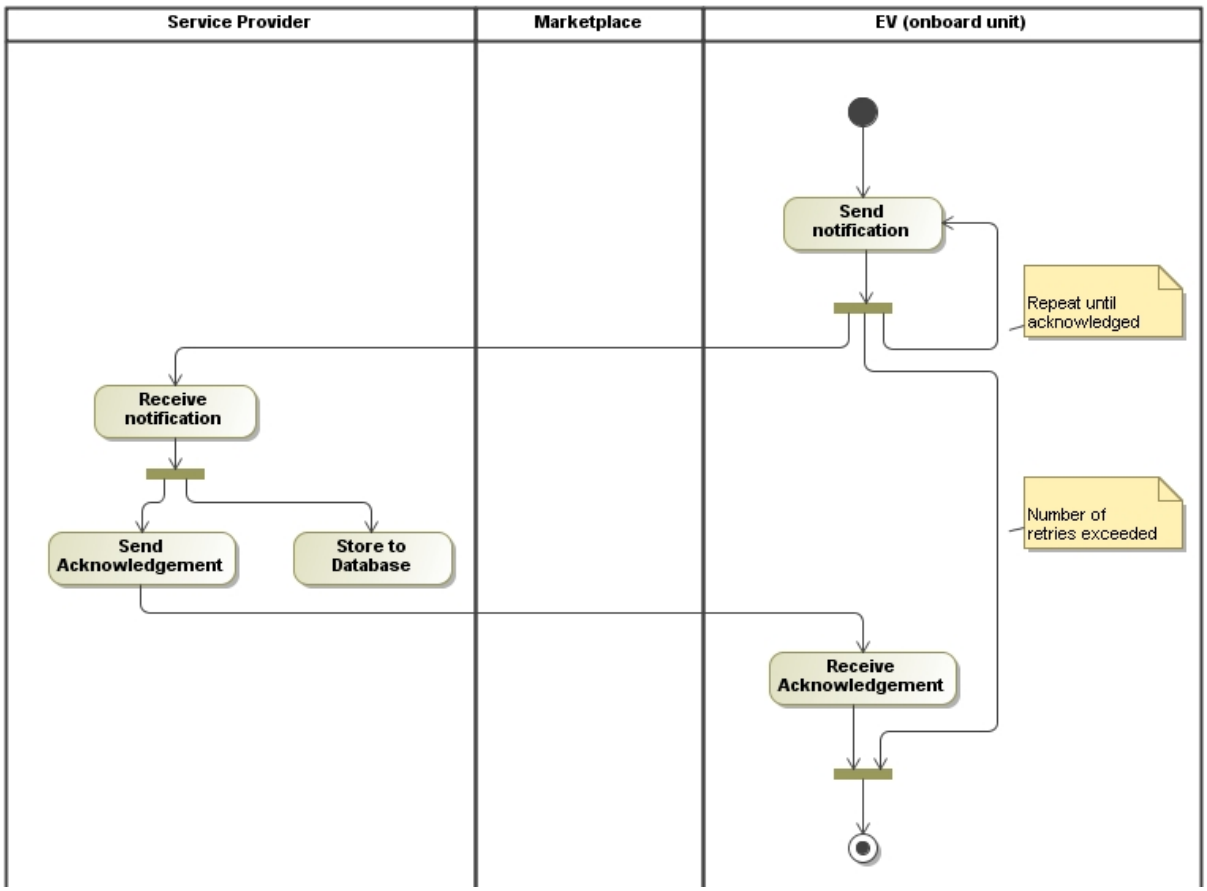


Figure 27 Send Notification V2M

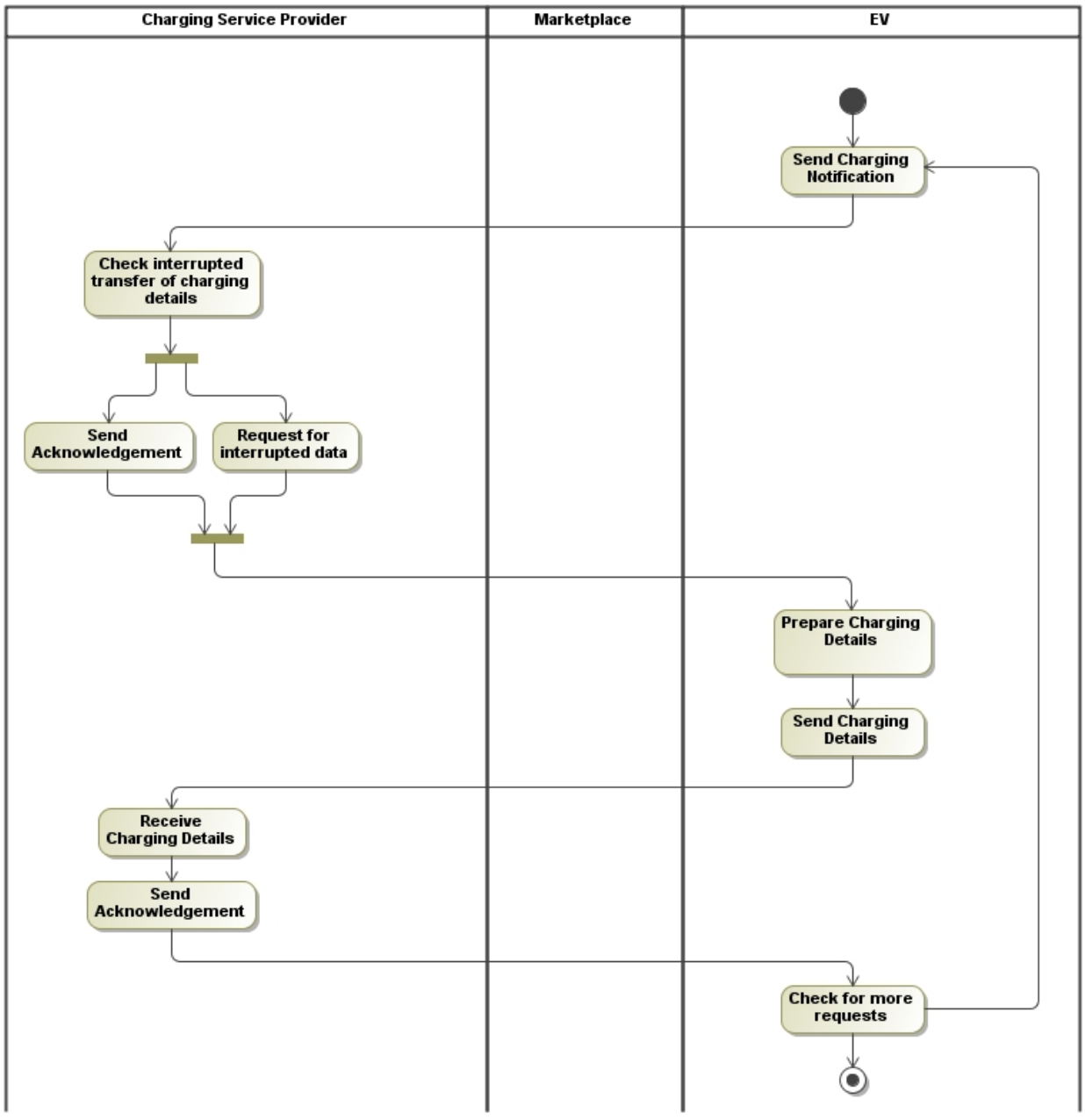


Figure 28 Update Charging Details

D. Use Cases in Chapters

E. Business Scenario's and their Features

For the development of Features and Use Cases, these Business Scenario's have been elaborated as illustrated in the following table:

ID	Business Scenario	Description	Satisfied By
1179	BS-C1a Charging at home	All services, basic end user and B2B related charging EV at residential location	557 FTR Reduce load of charging 960 FTR Charging and battery switching status notification 1809 FTR EVSE Service Access 1277 FTR Phone roaming 976 FTR Charging management 563 FTR User identification 953 FTR Human-machine interface (HMI) 1811 FTR EVSE Service Control 565 FTR Charge point selection 957 FTR Road side charging 1808 FTR Find Appropriate Charge Point / Battery Station 970 FTR Consumption monitoring 1812 FTR EVSE Service Monitoring 566 FTR Cross sale 562 FTR Low priority charging 1702 FTR Charging monitoring 558 FTR Increase the load of charging 950 FTR Charging as guest 979 FTR Authentication of user

ID	Business Scenario	Description	Satisfied By
1180	BS-C1b Semi-public charging	charging from a common AC supply and designated parking areas (e.g. shopping centers, airports, offices)	1808 FTR Find Appropriate Charge Point / Battery Station 970 FTR Consumption monitoring 951 FTR Charging report 1812 FTR EVSE Service Monitoring 566 FTR Cross sale 562 FTR Low priority charging 558 FTR Increase the load of charging 1358 FTR Connect-Charge-Disconnect 1702 FTR Charging monitoring 979 FTR Authentication of user 557 FTR Reduce load of charging 960 FTR Charging and battery switching status notification 1809 FTR EVSE Service Access 1277 FTR Phone roaming 1701 FTR Open access to EVSE 976 FTR Charging management 953 FTR Human-machine interface (HMI) 563 FTR User identification 1318 FTR Reservation of Charge Spot 1811 FTR EVSE Service Control 565 FTR Charge point selection 957 FTR Road side charging

ID	Business Scenario	Description	Satisfied By
1181	BS-C1c Public charging	charging at the curbside, in public spaces / parking lots	1358 FTR Connect-Charge-Disconnect 1702 FTR Charging monitoring 960 FTR Charging and battery switching status notification 557 FTR Reduce load of charging 1809 FTR EVSE Service Access 1277 FTR Phone roaming 1701 FTR Open access to EVSE 976 FTR Charging management 563 FTR User identification 953 FTR Human-machine interface (HMI) 1811 FTR EVSE Service Control 1318 FTR Reservation of Charge Spot 565 FTR Charge point selection 957 FTR Road side charging 1808 FTR Find Appropriate Charge Point / Battery Station 970 FTR Consumption monitoring 951 FTR Charging report 1812 FTR EVSE Service Monitoring 566 FTR Cross sale 558 FTR Increase the load of charging 979 FTR Authentication of user 562 FTR Low priority charging
1183	BS-C3 Mono-directional controlled charging	Charging can only be reduced or increased by DSO	562 FTR Low priority charging 557 FTR Reduce load of charging 1811 FTR EVSE Service Control 558 FTR Increase the load of charging
1184	BS-C4a Charging V2G	Electricity from EV battery is fed into the grid	1202 FTR V2G energy supply signal 1810 FTR EVSE Service Delivery
1185	BS-C4b Charging V2H	Electricity from EV batteries is provided to the household	560 FTR V2H supply signal

ID	Business Scenario	Description	Satisfied By
30	BS-E1b Centralized Congestion Mgmt - TOU tariff	DSO centrally monitors and controls all EVSE connected through its substations. DSO can disconnect (or modulate) each EVSE to prevent congestion on MV/LV grid.	1313 FTR Allow interrupting 961 FTR DSO predefines peaks 1316 FTR Emergency: DSO interrupts charging
31	BS-E1c Distributed Congestion Mgmt by Aggregators	Congestion management is performed by EVSPs upon a request from a DSO through Marketplace	560 FTR V2H supply signal 1202 FTR V2G energy supply signal 1317 FTR Peak shaving on LV 965 FTR Peak shaving on MV
33	BS-E1d Monitoring of EVSE		967 FTR History of EVSE use
34	BS-E2 Virtual Power plant	Use of the aggregated flexibility of currently charged EV batteries to offer regulating power or to trade on intra day markets.	560 FTR V2H supply signal 1202 FTR V2G energy supply signal 975 FTR Ancillary services 972 FTR Network congestion management 971 FTR Aggregated balancing capacity to the TSO 973 FTR Reactive power 974 FTR Phase balancing
1160	BS-O1 Enhanced charging	Services offered by the EVSP to end users or service requestors (B2B)	957 FTR Road side charging 1808 FTR Find Appropriate Charge Point / Battery Station 1810 FTR EVSE Service Delivery 966 FTR Current EV charge 917 FTR Basic enhanced charging 918 FTR Enhanced charging 561 FTR Priority charging 1317 FTR Peak shaving on LV 979 FTR Authentication of user 965 FTR Peak shaving on MV 961 FTR DSO predefines peaks 1322 FTR Listing of price 1303 FTR Intermodality planning 1701 FTR Open access to EVSE

ID	Business Scenario	Description	Satisfied By
			953 FTR Human-machine interface (HMI) 976 FTR Charging management 563 FTR User identification
1159	BS-O2c Safety	Services for safety of EV drivers	945 FTR Notification 944 FTR Vehicle tracking
1162	BS-O3 Driver enhanced services	Information collected from the car and analyzed for end user (e.g. battery history)	1321 FTR Eco driving 1808 FTR Find Appropriate Charge Point / Battery Station 920 FTR Battery life 945 FTR Notification 944 FTR Vehicle tracking 921 FTR Driving efficiency
1356	BS-O4 Basic charging	This scenario comprises basic charging services offered through the Marketplace	969 FTR EVSE Charging capabilities 1812 FTR EVSE Service Monitoring 1357 FTR Charge data collection 979 FTR Authentication of user 1701 FTR Open access to EVSE 953 FTR Human-machine interface (HMI) 563 FTR User identification 1278 FTR Identification of available EVSE 956 FTR Battery switching 1810 FTR EVSE Service Delivery 1808 FTR Find Appropriate Charge Point / Battery Station 966 FTR Current EV charge 978 FTR Search for charge point (or battery switch station)

ID	Business Scenario	Description	Satisfied By
1161	BS-R1 Contractual clearing	Roaming both between EVSE operators and between countries/regions concerning contractual clearing.	983 FTR CLEARING Managing customer data 979 FTR Authentication of user 1808 FTR Find Appropriate Charge Point / Battery Station 1291 FTR CLEARING Managing EVSP data 986 FTR Roaming in different countries 1804 FTR Roaming based on Bi-lateral Agreements 985 FTR Roaming in same country 984 FTR CLEARING Forwarding CDR 982 FTR CLEARING Validation of contract 981 FTR Authentication
1182	BS-R3a Differentiation of customer contracts, SLA-check	handling of different standard level agreements	564 FTR SLA 1811 FTR EVSE Service Control 562 FTR Low priority charging 558 FTR Increase the load of charging 979 FTR Authentication of user 557 FTR Reduce load of charging
1173	BS-S1 Marketplace: Buying, Selling, Routing	Value added service are offered, bought and paid for	1469 FTR Suspend/Resume Service Contract 926 FTR Call of Service 924 FTR Search and Select Service 1459 FTR Aggregate Service Call Results 1315 FTR Register Service 1447 FTR Contracting Service 1622 FTR Manage Requests for new Services 1685 FTR Create Notification to Service Requester 927 FTR Service Transaction overview 1617 FTR Marketplace - Authentication and Authorization
1174	BS-S2 Service Detail Records for Accounting and Billing	BS-S2 Service Detail Records for Accounting and Billing	924 FTR Search and Select Service 927 FTR Service Transaction overview 1617 FTR Marketplace - Authentication and Authorization

ID	Business Scenario	Description	Satisfied By
1175	BS-S3 B2B Contract Management	Create occurance of predefined Service Contract	1469 FTR Suspend/Resume Service Contract 924 FTR Search and Select Service 1682 FTR Add new Service to existing Service Contract 935 FTR Provide Service Contract Framework 931 FTR Change or Terminate Service Contract 1397 FTR Prolong Service Contract 1396 FTR Define and Register Service Contract 1617 FTR Marketplace - Authentication and Authorization
1176	BS-S4 Service provisioning/registration/life cycle mgmt	Service Life Cycle Management	924 FTR Search and Select Service 1315 FTR Register Service 1501 FTR Certificate Service 940 FTR Version Service 1444 FTR Delete Service 1617 FTR Marketplace - Authentication and Authorization 1443 FTR Enable / Disable Service
1177	BS-S5 Linking of Systems, Standardization of Interfaces, Messages	Managing the Marketplace connections with SP backend systems	1446 FTR Search and Select Standard Interfaces 1459 FTR Aggregate Service Call Results 1445 FTR Define new Standard Interface 1617 FTR Marketplace - Authentication and Authorization 1469 FTR Suspend/Resume Service Contract
1178	BS-S6 B2B Partner Management	Service Provider and Requestor Life Cycle	1386 FTR Delete Business Partner Account 1366 FTR Create Business Partner Account 1369 FTR Activate/Inactivate a Business Partner Account 1368 FTR Change Business Partner Account 1617 FTR Marketplace - Authentication and Authorization

F. Features: Where Used in Business Scenario's

ID	Feature	Satisfies
1369	FTR Activate/Deactivate a Business Partner Account	1178: BS-S6 B2B Partner Management
1459	FTR Aggregate Service Call Results	1173: BS-S1 Marketplace: Buying, Selling, Routing 1177: BS-S5 Linking of Systems, Standardization of Interfaces, Messages
971	FTR Aggregated balancing capacity to the TSO	34: BS-E2 Virtual Power plant
1313	FTR Allow interrupting	30: BS-E1b Centralized Congestion Mgmt - TOU tariff
975	FTR Ancillary services	34: BS-E2 Virtual Power plant
981	FTR Authentication	1161: BS-R1 Contractual clearing
979	FTR Authentication of user	1160: BS-O1 Enhanced charging 1182: BS-R3a Differentiation of customer contracts, SLA-check 1794: GRP Identification and Authentication of EV user 1180: BS-C1b Semi-public charging 1179: BS-C1a Charging at home 1181: BS-C1c Public charging 1356: BS-O4 Basic charging 1161: BS-R1 Contractual clearing
917	FTR Basic enhanced charging	1160: BS-O1 Enhanced charging
920	FTR Battery life	1162: BS-O3 Driver enhanced services 1797: GRP Driving Related Services
956	FTR Battery switching	1356: BS-O4 Basic charging
926	FTR Call of Service	1173: BS-S1 Marketplace: Buying, Selling, Routing
1300	FTR Car information	1798: GRP Cross Domain Services
1368	FTR Change Business Partner Account	1178: BS-S6 B2B Partner Management
931	FTR Change or Terminate Service Contract	1175: BS-S3 B2B Contract Management
1357	FTR Charge data collection	1356: BS-O4 Basic charging
1299	FTR Charge point management	1795: GRP Services During Charging
950	FTR Charging as guest	1179: BS-C1a Charging at home
1309	FTR Charging location mgmt	1543: Run Marketplace 1797: GRP Driving Related Services
976	FTR Charging management	1180: BS-C1b Semi-public charging 1179: BS-C1a Charging at home 1181: BS-C1c Public charging

ID	Feature	Satisfies
		1160: BS-O1 Enhanced charging 1795: GRP Services During Charging
1702	FTR Charging monitoring	1795: GRP Services During Charging 1180: BS-C1b Semi-public charging 1179: BS-C1a Charging at home 1181: BS-C1c Public charging
951	FTR Charging report	1180: BS-C1b Semi-public charging 1181: BS-C1c Public charging
984	FTR CLEARING Forwarding CDR	1161: BS-R1 Contractual clearing
983	FTR CLEARING Managing customer data	1161: BS-R1 Contractual clearing
1291	FTR CLEARING Managing EVSP data	1161: BS-R1 Contractual clearing
982	FTR CLEARING Validation of contract	1161: BS-R1 Contractual clearing
1320	FTR CO2 intensity	1798: GRP Cross Domain Services
1358	FTR Connect-Charge-Disconnect	1180: BS-C1b Semi-public charging 1181: BS-C1c Public charging
970	FTR Consumption monitoring	1796: GRP Services After Charging 1180: BS-C1b Semi-public charging 1179: BS-C1a Charging at home 1181: BS-C1c Public charging
1447	FTR Contracting Service	1173: BS-S1 Marketplace: Buying, Selling, Routing
1366	FTR Create Business Partner Account	1178: BS-S6 B2B Partner Management
1685	FTR Create Notification to Service Requester	1173: BS-S1 Marketplace: Buying, Selling, Routing
966	FTR Current EV charge	1356: BS-O4 Basic charging 1160: BS-O1 Enhanced charging
1396	FTR Define and Register Service Contract	1175: BS-S3 B2B Contract Management
1445	FTR Define new Standard Interface	1177: BS-S5 Linking of Systems, Standardization of Interfaces, Messages
1444	FTR Delete Service	1176: BS-S4 Service provisioning/registration/life cycle mgmt
961	FTR DSO predefines peaks	1160: BS-O1 Enhanced charging 30: BS-E1b Centralized Congestion Mgmt - TOU tariff
1443	FTR Enable / Disable Service	1176: BS-S4 Service provisioning/registration/life cycle mgmt
918	FTR Enhanced charging	1160: BS-O1 Enhanced charging
969	FTR EVSE Charging capabilities	1356: BS-O4 Basic charging
1301	FTR Fleet management	1798: GRP Cross Domain Services
967	FTR History of EVSE use	33: BS-E1d Monitoring of EVSE
1278	FTR Identification of available EVSE	1356: BS-O4 Basic charging
1303	FTR Intermodality planning	1798: GRP Cross Domain Services 1160: BS-O1 Enhanced charging

ID	Feature	Satisfies
562	FTR Low priority charging	1182: BS-R3a Differentiation of customer contracts, SLA-check 1795: GRP Services During Charging 1180: BS-C1b Semi-public charging 1183: BS-C3 Mono-directional controlled charging 1179: BS-C1a Charging at home 1181: BS-C1c Public charging
1622	FTR Manage Requests for new Services	1173: BS-S1 Marketplace: Buying, Selling, Routing
1617	FTR Marketplace - Authentication and Authorization	1174: BS-S2 Service Detail Records for Accounting and Billing 1173: BS-S1 Marketplace: Buying, Selling, Routing 1177: BS-S5 Linking of Systems, Standardization of Interfaces, Messages 1176: BS-S4 Service provisioning/registration/life cycle mgmt 1175: BS-S3 B2B Contract Management 1178: BS-S6 B2B Partner Management
972	FTR Network congestion management	34: BS-E2 Virtual Power plant
945	FTR Notification	1797: GRP Driving Related Services 1162: BS-O3 Driver enhanced services 1159: BS-O2c Safety
1701	FTR Open access to EVSE	1181: BS-C1c Public charging 1356: BS-O4 Basic charging 1160: BS-O1 Enhanced charging 1180: BS-C1b Semi-public charging
1297	FTR Parking space management	1797: GRP Driving Related Services
1298	FTR Parking space monitoring	1797: GRP Driving Related Services
1317	FTR Peak shaving on LV	1160: BS-O1 Enhanced charging 31: BS-E1c Distributed Congestion Mgmt by Aggregators
965	FTR Peak shaving on MV	31: BS-E1c Distributed Congestion Mgmt by Aggregators 1160: BS-O1 Enhanced charging
974	FTR Phase balancing	34: BS-E2 Virtual Power plant
561	FTR Priority charging	1160: BS-O1 Enhanced charging
1397	FTR Prolong Service Contract	1175: BS-S3 B2B Contract Management
935	FTR Provide Service Contract Framework	1175: BS-S3 B2B Contract Management
973	FTR Reactive power	34: BS-E2 Virtual Power plant
1315	FTR Register Service	1173: BS-S1 Marketplace: Buying, Selling, Routing 1176: BS-S4 Service provision-

ID	Feature	Satisfies
		ing/registration/life cycle mgmt
1318	FTR Reservation of Charge Spot	1793: GRP Services Before Charging 1180: BS-C1b Semi-public charging 1181: BS-C1c Public charging
1804	FTR Roaming based on Bi-lateral Agreements	1161: BS-R1 Contractual clearing
986	FTR Roaming in different countries	1161: BS-R1 Contractual clearing
985	FTR Roaming in same country	1161: BS-R1 Contractual clearing
924	FTR Search and Select Service	1173: BS-S1 Marketplace: Buying, Selling, Routing 1174: BS-S2 Service Detail Records for Accounting and Billing 1176: BS-S4 Service provisioning/registration/life cycle mgmt 1175: BS-S3 B2B Contract Management
1446	FTR Search and Select Standard Interfaces	1177: BS-S5 Linking of Systems, Standardization of Interfaces, Messages
978	FTR Search for charge point (or battery switch station)	1356: BS-O4 Basic charging
927	FTR Service Transaction overview	1174: BS-S2 Service Detail Records for Accounting and Billing 1173: BS-S1 Marketplace: Buying, Selling, Routing
564	FTR SLA	1182: BS-R3a Differentiation of customer contracts, SLA-check
1469	FTR Suspend/Resume Service Contract	1173: BS-S1 Marketplace: Buying, Selling, Routing 1177: BS-S5 Linking of Systems, Standardization of Interfaces, Messages 1175: BS-S3 B2B Contract Management
1296	FTR Third party information	1797: GRP Driving Related Services
563	FTR User identification	1180: BS-C1b Semi-public charging 1181: BS-C1c Public charging 1794: GRP Identification and Authentication of EV user 1179: BS-C1a Charging at home 1356: BS-O4 Basic charging 1160: BS-O1 Enhanced charging
1202	FTR V2G energy supply signal	34: BS-E2 Virtual Power plant 31: BS-E1c Distributed Congestion Mgmt by Aggregators 1184: BS-C4a Charging V2G

ID	Feature	Satisfies
560	FTR V2H supply signal	31: BS-E1c Distributed Congestion Mgmt by Aggregators 34: BS-E2 Virtual Power plant 1185: BS-C4b Charging V2H
944	FTR Vehicle tracking	1797: GRP Driving Related Services 1162: BS-O3 Driver enhanced services 1159: BS-O2c Safety
940	FTR Version Service	1176: BS-S4 Service provisioning/registration/life cycle mgmt

G. Use Cases: Where Used in Features

ID	Use Case	Realizes Feature
1502	UC EV Identification, Authentication and Authorization	986: FTR Roaming in different countries 985: FTR Roaming in same country 1812: FTR EVSE Service Monitoring 1804: FTR Roaming based on Bi-lateral Agreements 1702: FTR Charging monitoring 1809: FTR EVSE Service Access 563: FTR User identification 1704: NFR Tap RFID to access EVSE 979: FTR Authentication of user 1705: NFR Connect EV and EVSE with cable
1548	UC Access Car Information	1303: FTR Intermodality planning 1300: FTR Car information
1379	UC Activate Business Partner Account	1369: FTR Activate/Inactivate a Business Partner Account
1519	UC After charging	970: FTR Consumption monitoring
1492	UC Aggregate Service Call Results	1459: FTR Aggregate Service Call Results
1598	UC Aggregated EV charge overview by the DSO	966: FTR Current EV charge
1522	UC Assign car to scenario	1301: FTR Fleet management
1510	UC Before charging	1812: FTR EVSE Service Monitoring 1318: FTR Reservation of Charge Spot
1561	UC Calculate CO2 Emission	970: FTR Consumption monitoring 1812: FTR EVSE Service Monitoring
1567	UC Call For Roadside Assistance	944: FTR Vehicle tracking
1241	UC Call of Service	926: FTR Call of Service
1376	UC Change Business Partner Account	1368: FTR Change Business Partner Account 1369: FTR Activate/Inactivate a Business Partner Account
1378	UC Change Business Partner Account Details	1368: FTR Change Business Partner Account
1517	UC Change Customer Contract by Customer himself within Clearing House	983: FTR CLEARING Managing customer data
1515	UC Change Customer Contract by Service Provider in Clearing House	983: FTR CLEARING Managing customer data

ID	Use Case	Realizes Feature
1500	UC Change EVSP/EVSE Contract within Clearing House	1291: FTR CLEARING Managing EVSP data
1626	UC Change Request for a new Service	1622: FTR Manage Requests for new Services
1624	UC Change Service Contract Offering	1396: FTR Define and Register Service Contract
1529	UC Charging Location mgmt	1309: FTR Charging location mgmt
1592	UC CO2 Reporting	1320: FTR CO2 intensity
1247	UC Confirm Service Contract Change	940: FTR Version Service 931: FTR Change or Terminate Service Contract
1481	UC Confirm Service Contract Termination	1369: FTR Activate/Inactivate a Business Partner Account 1443: FTR Enable / Disable Service 931: FTR Change or Terminate Service Contract
1575	UC Crash Notification	944: FTR Vehicle tracking
1374	UC Create Business Partner Account	1366: FTR Create Business Partner Account
1514	UC Create Customer Contract by Service Provider in Clearing House	982: FTR CLEARING Validation of contract 983: FTR CLEARING Managing customer data
1497	UC Create EVSP/EVSE Contract within Clearing House	1291: FTR CLEARING Managing EVSP data 982: FTR CLEARING Validation of contract
1625	UC Create Request for a new Service	1622: FTR Manage Requests for new Services
1629	UC Create Response on Requests for new Services	1622: FTR Manage Requests for new Services
1485	UC Create Service Contract	1396: FTR Define and Register Service Contract 1447: FTR Contracting Service
1246	UC Create Service Contract Change Request	940: FTR Version Service 931: FTR Change or Terminate Service Contract
1470	UC Create Service Contract Offering	1315: FTR Register Service 1396: FTR Define and Register Service Contract
1480	UC Create Service Contract Termination Request	1369: FTR Activate/Inactivate a Business Partner Account 1443: FTR Enable / Disable Service 931: FTR Change or Terminate Service Contract
1477	UC Create Service Registration Contract	1315: FTR Register Service
1491	UC Create Service Transaction	926: FTR Call of Service
1516	UC Delete Customer Contract by Service Provider from Clearing House	983: FTR CLEARING Managing customer data

ID	Use Case	Realizes Feature
1513	UC Delete EVSP/EVSE Contract from Clearing House	1291: FTR CLEARING Managing EVSP data
1627	UC Delete Request for a new Service	1622: FTR Manage Requests for new Services
1478	UC Download Service Content	1447: FTR Contracting Service
1487	UC Download Service Specification	1446: FTR Search and Select Standard Interfaces 1447: FTR Contracting Service
1518	UC During charging	986: FTR Roaming in different countries 985: FTR Roaming in same country 1309: FTR Charging location mgmt 976: FTR Charging management 981: FTR Authentication 1299: FTR Charge point management 1704: NFR Tap RFID to access EVSE 1705: NFR Connect EV and EVSE with cable 1812: FTR EVSE Service Monitoring 1804: FTR Roaming based on Bi-lateral Agreements 1810: FTR EVSE Service Delivery 1811: FTR EVSE Service Control 562: FTR Low priority charging 1809: FTR EVSE Service Access 1702: FTR Charging monitoring
1486	UC Enable/Disable Service permanently	1443: FTR Enable / Disable Service 940: FTR Version Service
1511	UC End a roaming charging process with Clearinghouse	984: FTR CLEARING Forwarding CDR 986: FTR Roaming in different countries 985: FTR Roaming in same country
1524	UC Fleet manager monitors energy consumption of pool-cars	966: FTR Current EV charge 1301: FTR Fleet management 970: FTR Consumption monitoring
1523	UC Fleet manager tracks pool-car	944: FTR Vehicle tracking 1301: FTR Fleet management
1602	UC flexible load for congestion management	972: FTR Network congestion management
1599	UC History of EVSE use	967: FTR History of EVSE use
1380	UC Inactivate Business Partner Account	1369: FTR Activate/Inactivate a Business Partner Account
1618	UC Marketplace - Login	1617: FTR Marketplace - Authentication and Authorization
1619	UC Marketplace - Logout	1617: FTR Marketplace - Authentication and Authorization
1687	UC Notify Service Requesters of own Service	1443: FTR Enable / Disable Service 1685: FTR Create Notification to Service Requester
1557	UC Parking Space Management	1297: FTR Parking space management

ID	Use Case	Realizes Feature
1563	UC Parking Space Monitoring	1298: FTR Parking space monitoring
1596	UC Peak load threshold on a substation	961: FTR DSO predefines peaks
1597	UC Peak shaving	1317: FTR Peak shaving on LV 965: FTR Peak shaving on MV 961: FTR DSO predefines peaks
1257	UC Propose new Standard Interface	1445: FTR Define new Standard Interface
1601	UC provide balancing capacity	971: FTR Aggregated balancing capacity
1494	UC Publish Service	940: FTR Version Service 1315: FTR Register Service
1493	UC Publish Standard Interface	1445: FTR Define new Standard Interface
1572	UC Reduce Charge Power by DSO	1313: FTR Allow interrupting
1250	UC Register Service	1315: FTR Register Service
1562	UC Report Electricity Consumption	970: FTR Consumption monitoring 1812: FTR EVSE Service Monitoring
1528	UC Reservation of EVSE (1318)	1318: FTR Reservation of Charge Spot
1605	UC Reserve and activate ancillary services	975: FTR Ancillary services 973: FTR Reactive power 974: FTR Phase balancing
1373	UC Search and Select Business Partner	1369: FTR Activate/Inactivate a Business Partner Account 1368: FTR Change Business Partner Account 1366: FTR Create Business Partner Account
1620	UC Search and Select Requests for new Services	1622: FTR Manage Requests for new Services
1245	UC Search and Select Service Contracts	1447: FTR Contracting Service 926: FTR Call of Service 1443: FTR Enable / Disable Service 1469: FTR Suspend/Resume Service Contract 940: FTR Version Service 931: FTR Change or Terminate Service Contract
1242	UC Search and Select Service Transactions	927: FTR Service Transaction overview
1239	UC Search and Select Services	940: FTR Version Service 1447: FTR Contracting Service 927: FTR Service Transaction overview 924: FTR Search and Select Service
1475	UC Search and Select Standard Interface	1446: FTR Search and Select Standard Interfaces 1445: FTR Define new Standard Interface 1315: FTR Register Service
1527	UC Search for EVSE (978)	1278: FTR Identification of available EVSE

ID	Use Case	Realizes Feature
1576	UC Set Geofence	944: FTR Vehicle tracking
1564	UC Show Current EV Position	944: FTR Vehicle tracking
1568	UC Show EV Position History	944: FTR Vehicle tracking
1512	UC Start a roaming charging process with Clearinghouse	986: FTR Roaming in different countries 985: FTR Roaming in same country 983: FTR CLEARING Managing customer data 1291: FTR CLEARING Managing EVSP data 982: FTR CLEARING Validation of contract 981: FTR Authentication
1255	UC Start/Stop Service	1443: FTR Enable / Disable Service
1521	UC Status for cars can be maintained by Fleet Manager	1301: FTR Fleet management
1490	UC Suspend/Resume Service Contract by Service Requester	1469: FTR Suspend/Resume Service Contract
1574	UC Third Party Information	1296: FTR Third party information
1569	UC Transmit Notification	945: FTR Notification
1558	UC Update Charging Details	920: FTR Battery life 1812: FTR EVSE Service Monitoring
1488	UC Upload Service Content	1315: FTR Register Service 940: FTR Version Service
1489	UC Upload Service Specification	1445: FTR Define new Standard Interface 1315: FTR Register Service 940: FTR Version Service
1525	UC User wants travel and has specific requirements	1303: FTR Intermodality planning
1520	UC Users can book pool-cars online	1301: FTR Fleet management 1303: FTR Intermodality planning
1604	UC Vehicle to grid signal	1202: FTR V2G energy supply signal 974: FTR Phase balancing 560: FTR V2H supply signal 975: FTR Ancillary services 972: FTR Network congestion management 971: FTR Aggregated balancing capacity 973: FTR Reactive power
1377	UC View Business Partner Account Details	1366: FTR Create Business Partner Account 1369: FTR Activate/Inactivate a Business Partner Account 1368: FTR Change Business Partner Account
1623	UC View Details of Requests of new Services	1622: FTR Manage Requests for new Services
1479	UC View Service Contract Details	931: FTR Change or Terminate Service Contract 1396: FTR Define and Register Service Contract 1443: FTR Enable / Disable Service 1469: FTR Suspend/Resume Service Contract

ID	Use Case	Realizes Feature
1482	UC View Service Contract Template	935: FTR Provide Service Contract Framework 1315: FTR Register Service 1396: FTR Define and Register Service Contract
1484	UC View Service Details	1396: FTR Define and Register Service Contract 1447: FTR Contracting Service 924: FTR Search and Select Service
1471	UC View Service Transaction Details	927: FTR Service Transaction overview
1476	UC View Standard Interface Details	1446: FTR Search and Select Standard Interfaces 1315: FTR Register Service 1445: FTR Define new Standard Interface