Green eMotion

Development of a European Framework for Electro mobility

Deliverable 3.4

Electric Mobility Business Requirements Enabling Services Through Central IT Platform

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Table of contents

Executive summary

This deliverable comprises a very thorough set of requirements for e-mobility organized through shared IT platforms, such as the Green eMotion Marketplace. Partners who are leading the key e-mobility related industries and participate in this work package (WP3) have defined services carefully chosen based on their high added value to the end users, their likely early market adoption, business applicability, and usability. It is expected that these requirements will contribute to the electric mobility industry by enabling market players to efficiently develop functions and services on their IT infrastructures. The immense effort of e-mobility experts spent on defining of which information can be handled by IT systems and how the stakeholders can interact, all summarized in this deliverable, shall serve as a "what to build" recipe to the EV service providers, energy utilities, public sector, OEMs and others.

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. Selection of these requirements was further detailed by IT developers in the specification phase in deliverable D3.5, leading to the first release of the Green eMotion Marketplace. This deliverable D3.4 is incorporating feedback from demo regions and the executive board as well as the lessons learned from the Release one implementation. It comprises a complete set of business requirements of Green eMotion, including those described in D3.3, improved and enhanced features and use cases, improved structure and inclusion of additional use cases based on the feedback. Selection of the use cases from this deliverable will be specified and developed by the Green eMotion partners for the second and final release of the Marketplace.

This deliverable provides, in form of structured ICT requirements, an overview of all services described by the Green eMotion project partners. Over one hundred use cases described in this deliverable outline the business interactions around the central IT information platform. This platform, the Marketplace itself is described in chapter 2 listing all core Marketplace services and also interconnection between marketplaces. Chapter 3 features General basic and value added services of electric mobility such as Search and reservation of EVSE, Chapter 4 describes Roaming provided by a contractual Clearing house, and Chapter 5 encompasses the Energy and smart grid perspective, including congestion management for DSO and potential aggregator market interactions in the future. This comprehensive export from the RRC tool is grouped in several chapters:

- Core/platform marketplace services are described in Chapter 2 by IBM. Core / platform services enable the functioning of the Marketplace and facilitate stakeholders to offer and request business services. The core marketplace services domain describes the essential services to run the

marketplace itself. The possible communication patterns enabling the interconnection of Marketplaces are described and evaluated in a separate section of this chapter introduction, named Multi Marketplace overview.
- General e-mobility services in Chapter 3 include all charging and driving related basic and value added services spanning from identification and authorization, through EVSE service monitoring, payment settlements, search and reservation to sophisticated services such as intermodality planning and vehicle telemetry to cloud charging.
- Roaming services are described in Chapter 4 led by SAP. 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 inter company and inter-country roaming through the validation of contracts between different EVSE Operators and EVSPs as well as their respective customers. Financial clearing, which deals with consolidated rating and billing, is already available in other industries and can be applied analogously in the electric vehicles market, however not demonstrated in this project.
- Energy services are described in Chapter 5 by Enel. 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. 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.
- Usability requirements for selected B2B and B2C services are described in Chapter 6.

Structured Requirements Management Method with the use of the IBM Rational Requirements Composer (RRC) was the main methodology used to collect the requirements. Work package 3 partners identified Features (divided into basic and value added business services, and core marketplace services) and described them in detail through Use cases.

This deliverable comprises over one hundred requirements that form a very complete technical description of various possibilities of the emerging e-mobility cross industry space. Some of the use cases are already demonstrated by the demo regions of Green eMotion utilizing the first release IT environment of the Green eMotion Marketplace (Search EVSE, Roaming via Clearinghouse or Load management), others are to be developed and demonstrated in the second release of the Marketplace (Reservation of EVSE, other) but many of the use cases described in this deliverable will remain only described, without being demonstrated in this project.

Disclaimer: The finite budget and time frame of the Green eMotion project does not allow project partners to demonstrate all of the described use cases, their thorough description by technical experts from WP3 in this public deliverable, however, enables other projects and commercial establishments to develop them in the future. It is one of the goals of the Green eMotion to share expertise allowing such development.
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 Chapter1.

Chapter 1: Introduction to the Green eMotion Business Requirements

One of the main values of the Green eMotion project is the combination of multiple perspectives of e-mobility. This involves not only the different regional perspectives within Europe, but also the perspectives from different stakeholders and industries, as was recognized already in deliverables D3.1 and D3.3. The key objective of Work Package 3 is to develop and implement a Marketplace and interconnection between the existing IT information hubs for e-mobility that would enable clearing-houses and other service providers to interact and to develop and implement interfaces to efficiently support B2B business relations. The purpose of Work Package 3 is also to demonstrate regional ongoing and upcoming implementations of marketplaces and service providers.

The D3.4 deliverable comprises in a structured form of business requirements all currently known functional aspects of e-mobility under the assumption of the use of shared information platform, the GeM Marketplace, or other existing information hubs and their possible interconnection. Use cases in this deliverable were suggested because of their potentially high commercial added value and for their likely early market adoption expected by the project partners.

1.1 Structure of the chapters

Each requirements chapter (Chapter 2-5) starts with an easy to read introduction outlining the key assumptions and the motivations of the GeM partners for the description of particular use cases. This overview should give a coherent view of the industry / use case domain and bring focus to its important services. The reader can also find contextual charts and examples / brief executive summaries of selected use cases in this introductory text. At the end of each introduction there is a tree diagram with a simplified structure of the use cases followed by the list of headings and IDs of the Features described in the chapter and the headings and IDs of the Use cases grouped by these Features (one Use case can realize several Features). After the overview, each chapter has a Feature section, which includes the full description of all Features. For ease of reading and orientation, the titles and IDs of all Use cases realizing each Feature are listed at the end of its description. Use cases are then grouped by their order of occurrence after each Chapter. Please note that each Feature is attributed to only one Chapter but Use cases can realize more then one Feature.

1.2 Division of requirements into chapters

The **Marketplace core services** and communication patterns between different EV information hubs on the same level (multi marketplace communication) are described in **Chapter 2**. This is the only chapter describing core services (Chapters 3-5 describe business services). By nature this domain is more technical than the other domains and describes the core IT environment of the

project. Part of this chapter introduction is also an elaboration on the technical possibilities of Marketplace (IT hubs) interconnection, which has become an important theme due to the developments in the e-mobility market with emerging commercial marketplaces based on the Green eMotion model.

Basic requirements from across the e-mobility related industries, and all requirements around charging and driving of the EV is described in the **General e-mobility chapter (3**). This is the largest chapter of the document and covers use cases spanning from basic services such as Identification at charge pole, to sophisticated value added services around intermodality planning and connection of the EV telemetry to cloud environments.

The **Roaming chapter (4)** describes 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. Financial clearing, which deals with consolidated rating and billing, is already available in other industries and can be applied analogously in the electric vehicles market. It is, however, not demonstrated in this project.
The **Energy Chapter (5)** 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.

Usability aspects of the selected business services are described in **Chapter 6.**

1.3 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 divided the high level Business scenarios from D3.1 into Features and realized these features by comprehensively described Use cases. These artefacts 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.

The use of the RRC tool helped to increase the Green eMotion Project WP3 team's requirements gathering efficiency in three distinct ways. It eliminated wasteful effort, rework, updates and changes based on the feedback between releases, was easy to implement. Finally, the RRC enabled WP3 sub-teams to gain visibility into project progress and status, and was tightly integrated with the quality management process. The project did not exploit all of the artefacts generated by RRC. Remaining functions of this tooling are efficiently used in technical specification deliverables and standardization efforts (e.g. business objects in the EMI3 group).

The WP3 team and the extended Green eMotion team had several prioritization rounds of the services already described in D3.3. Feedback from the regions implementing the first release of the Marketplace and results of several brainstorming session, one held together with the GeM executive board, were implemented by the team. Features serve as textual representation of background information of the use cases and based on the prioritization rounds some were rewritten, enhanced and relations between some of them were re-organized.

The Use Cases give the most detailed description of single business (sub) processes; they effectively specify how a feature will be realized. 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 and exported in the specification deliverable D3.5 and D3.6.

Figure 2 on the next page illustrates the artefacts of the meta model used to define GeM requirements.

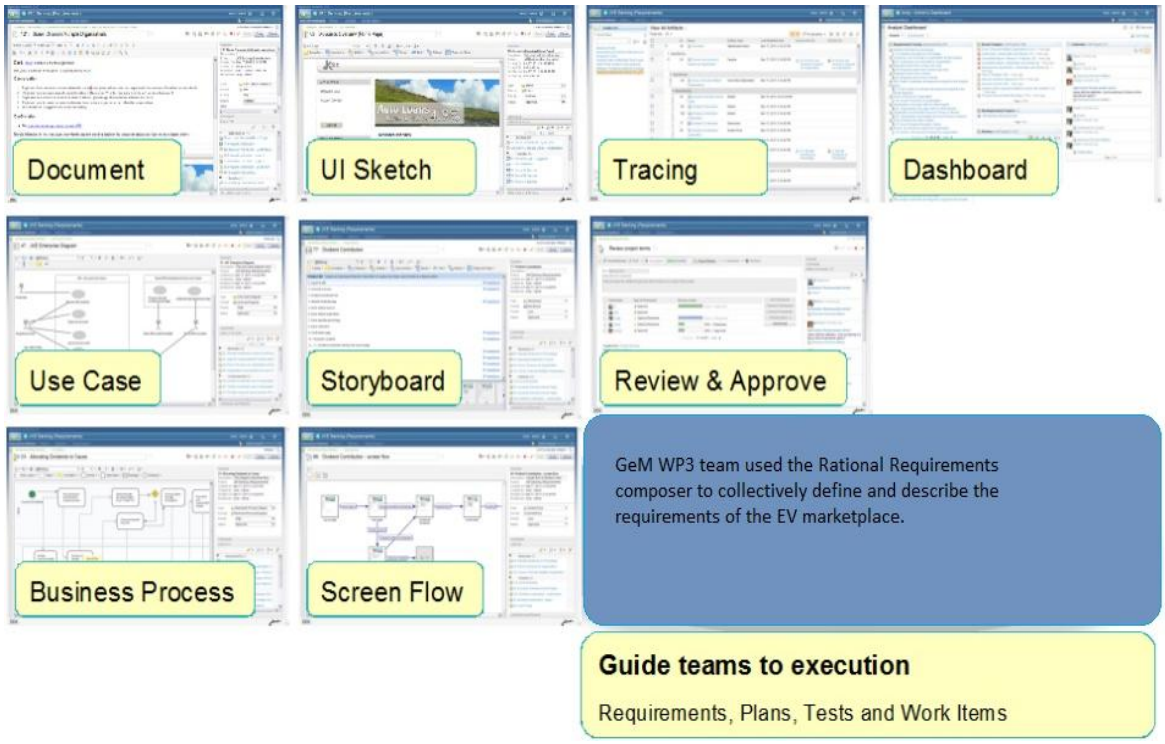


Figure 2 Requirements gathering - Artefacts in the RRC tool

1.4 How to read this document

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

1. Read the introduction first
2. Select the chapter of interest based on the industry you are interested in: If looking for a general impression read each chapter introduction for an overview, if looking for a particular service read the structure and list of Features at the end of each overview section and follow to the second section of each chapter for the full description of Features and list of their use cases.
3. Select the features (service) of interest then read its description. At the end of each feature description there is a list of use cases with their ID and title.
4. To search for a particular use case you can refer to the table of contents or refer directly to the appendix, which lists all use cases in order as they appear in the document.

The Document is primarily divided into chapters by logical grouping of the features (services) to which the order of Use cases is subordinated.

The Appendix includes a complete list of use cases organized by the chapters in which they are fully described. Each chapter starts with a table containing an overview of actors and services / features. This is followed by detailed Use case descriptions that realise the Features.

Chapter 2: Core Marketplace environment and Multi Marketplace Interconnection

2.1 Introduction

Per definition, the Green eMotion Marketplace is a virtual B2B marketplace for e-mobility related services. Like any other marketplace, the Green eMotion Marketplace allows the market participants to offer, request and trade goods. In contrast to a real marketplace where people need to meet in person, the GeM Marketplace is a virtual marketplace, accessible through the internet and hosted in a cloud environment.

The market participants are parties which operate a business in the area of e-mobility - this includes but is not limited to operators of charging equipment (EVSE Operators), EV service providers who offer services to EV drivers (EVSPs), energy service providers (utilities, DSOs, TSOs, energy retailers), car manufacturers (OEMs) and IT service providers. While the end customers do not have direct access to the GeM Marketplace, they use IT as well as non IT services from the market participants who offer and access IT services on the GeM Marketplace in order to collaborate and ultimately enable end user services.

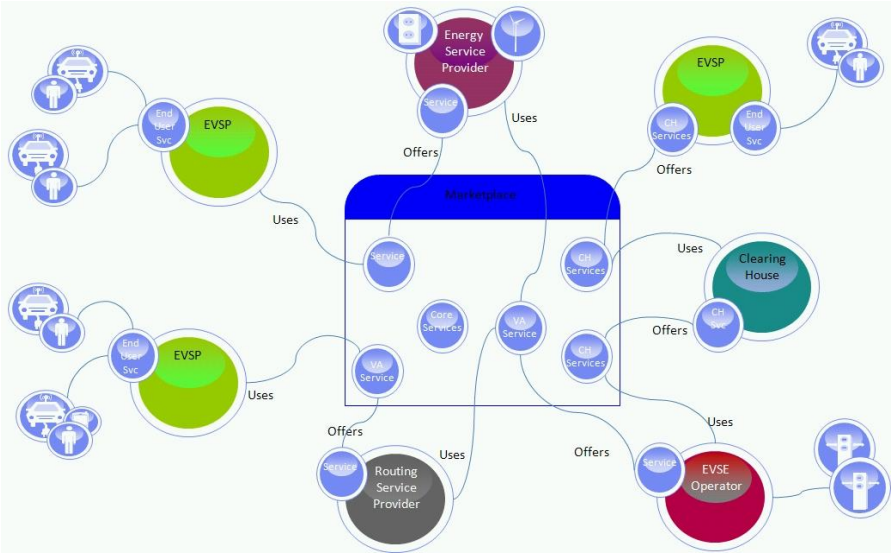


Figure 3: Electric mobility stakeholders interconnected via the Marketplace

The goods being traded are e-mobility related IT services. In other words, no physical goods like charging equipment or electric vehicles are being traded, not even energy. Instead IT services which support the processes required to perform the e-mobility related business operations within and across companies are the subject of offers and requests.

The GeM marketplace can logically be split into two major areas:

- the technical part, which performs the actual execution of the IT services across different parties
- the commercial part, which supports the processes to register parties and offer/contract services

In GeM the technical part is called dynamic service gateway (DSG). From a high level perspective the DSG can be looked at as a central service hub which interconnects the backend services from all marketplace participants. Instead of just routing the requests from one party to another, it identifies the requesting party and - depending on contractual relationships between the parties - it authorizes and forwards the request or denies it. All forwarded request are tracked in order to provide a transaction history to the parties involved.

The commercial part provides a user interface to the market place participants and offers services in the following functional areas:

- Registration and maintenance of business partner/user accounts
- Authentication (login/logout)
- Creation and maintenance of service categories (standard services)
- Creation and publication of service offers
- Creation of contracts between business partners based on service offers
- Termination of contracts
- Search functionalities for categories, services and contracts
- Transaction details for service usage

2.2 Service Offering and Contract Lifecycle

As DSG requires valid service contracts in order to allow service routing through it, the main purpose of the major part of the market place store use cases is to work towards valid contracts through a defined process.

The following state diagram shows how the offering process works:

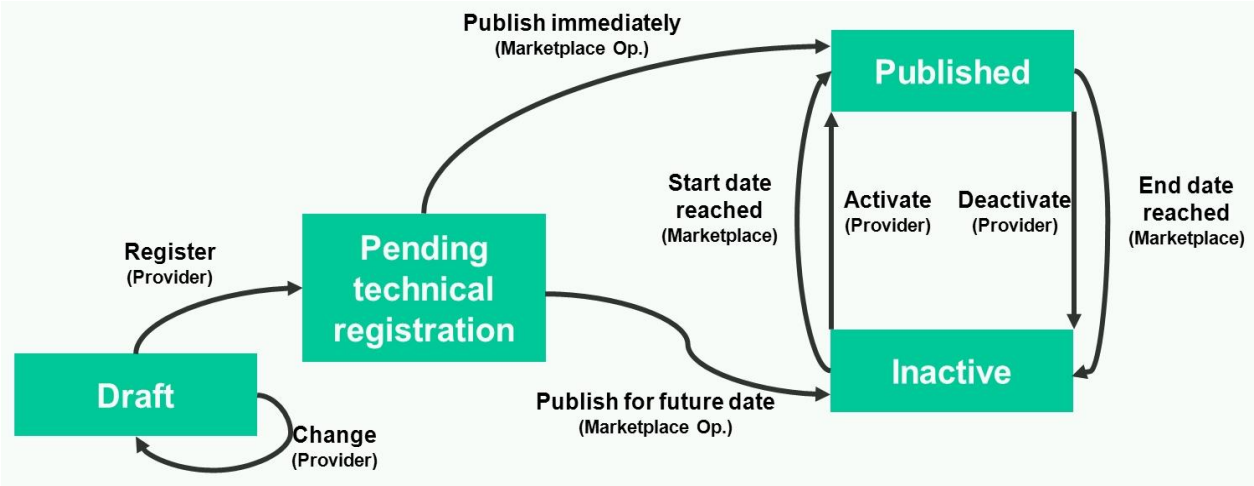


Figure 4: Service offering life cycle

The process begins with a draft service offering which the provider creates. He can change the offering as often as he likes until he registers it. Based on the information provided in the offering, the marketplace operator performs the technical registration, which includes but is not limited to, sanity checks of the technical artefacts, registration within the actual communication component and optionally, basic communication tests. After the technical registration has been done, the service can be published immediately if no start date is being provided or the start date of the offering has been passed already. In case of a provided start date in the future, the service will become inactive first, unless the published start date has been reached. The transition between the states based on start and end dates performed by the marketplace automatically. In addition, the provider can change the state manually as he likes.

Only a service offering in the published state is visible and available to business partners for contracting. Therefore searching through the available services and selecting one of them as basis for contract creation is the next logical step for a requester in order to start the contract process:

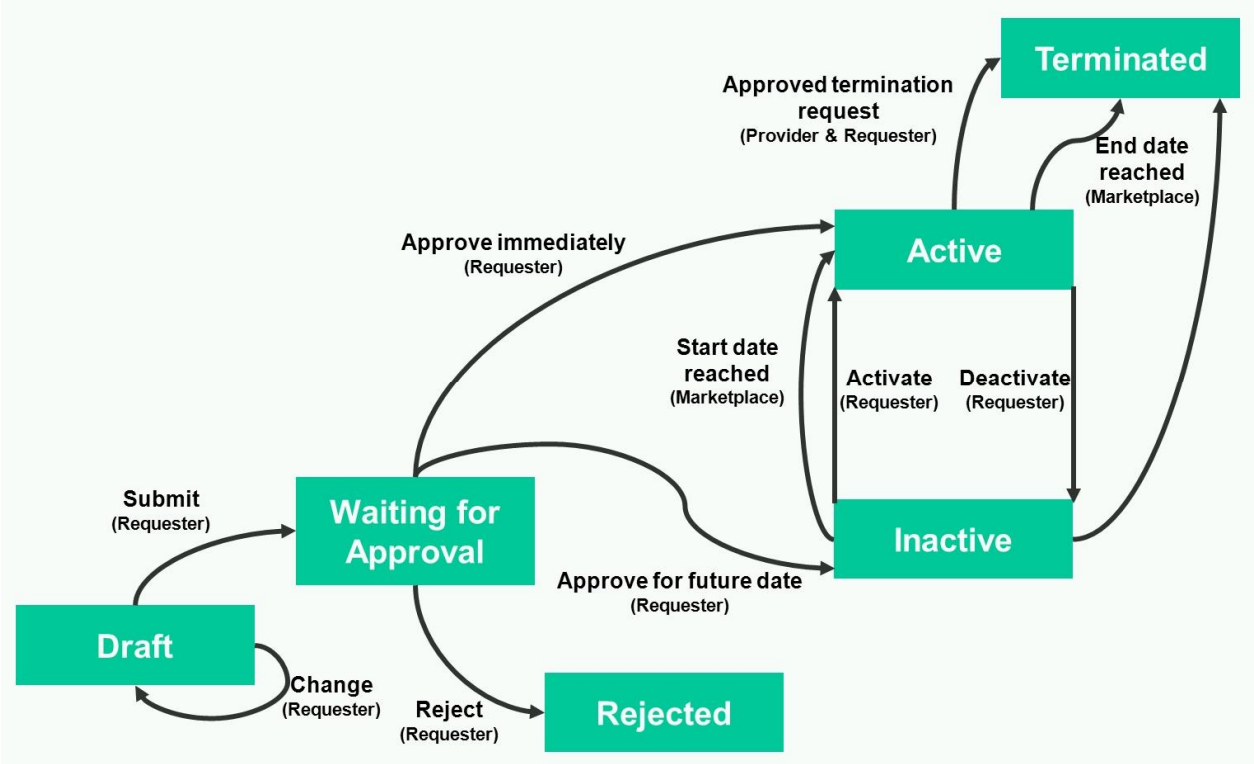


Figure 5: Service contract lifecycle

Similar to the process before, the requester begins with a draft contract based on the selected service offering and can change this until he decides to submit the contract. After submission there is an approval step inserted before the contract can actually become active. In the process shown above the approval is a simple one-step approval within the organisation of the requester. In a real world scenario this could be performed by two different roles within the requester's organization - while the submission of a contract could be performed by technical personnel, the approval could be performed by business and/or legal staff with the power to close contracts. In addition, similar approval steps within the provider organization could be added. However, as soon as one of the approvals fails, the contract becomes rejected. If, instead, all approvals have been given, depending on the start date of the contract it might become active immediately or stay inactive until the start date has been reached or the contract is activated by the requester. While the activate and deactivate transitions are manual tasks, the transitions based on the start and end date are performed automatically by the marketplace. After the end date has been reached the contract will be terminated. If both contract parties, requester and provider, agree on an earlier termination, the contract will be terminated.

For non IT services the same process applies with the only exception, that a technical registration of the service does not take place and therefore a call through DSG will not be possible. Non IT services can be used for roaming agreements or data usage agreements between business partners. Other IT services like the clearing house or Search EVSE might validate the state of those agreements through the marketplace in order to control their own behaviour based on the information being returned (e.g. allow roaming or not).

2.3 Marketplace Ecosystem

In order to put the core marketplace components into a bigger context, the following picture shows the full blown B2B marketplace ecosystem:

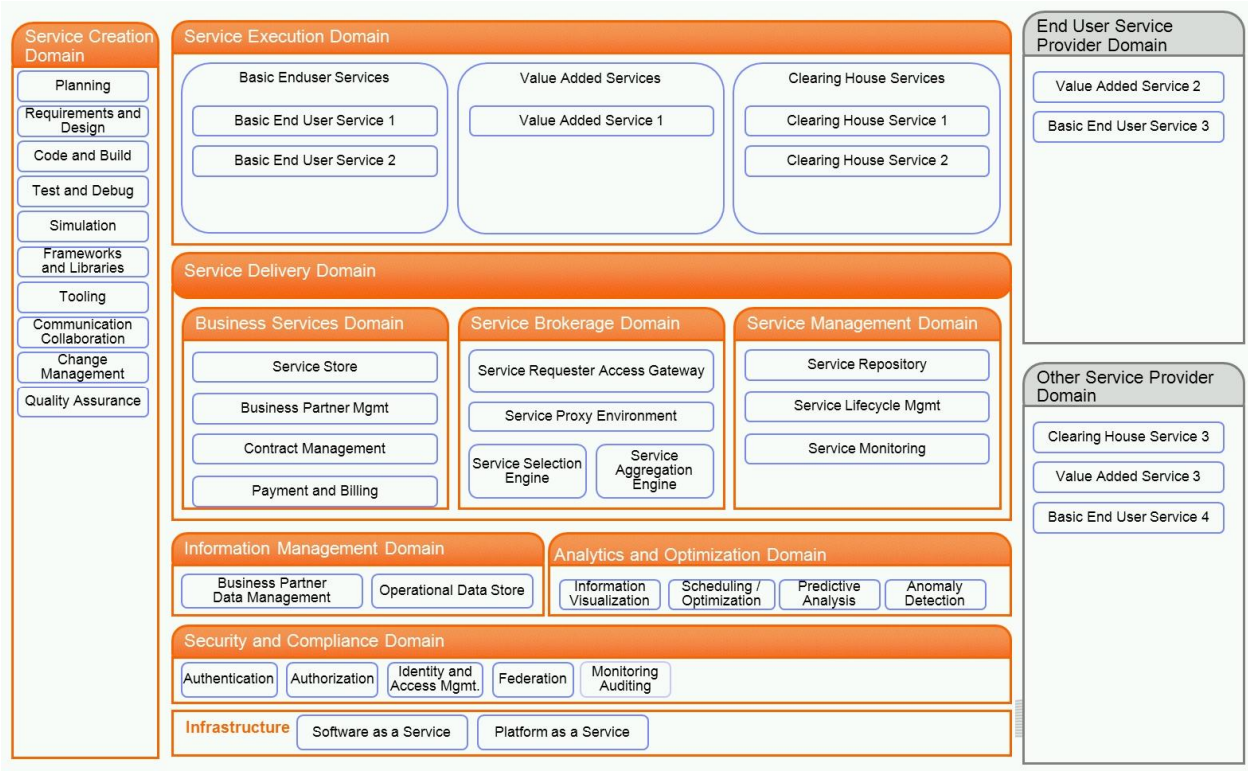


Figure 6: Ecosystem of the Green eMotion Marketplace

The major part of the service delivery domain - actually everything but payment and billing - is covered by the features and use cases described within the requirements analysis. In respect to the foundation domains, only the domains required in order to perform the functions are partially covered as far as required. For instance there are implicit references to business partner data as well as transactional data which fall into the information management domain. The service monitoring feature contains references to potential information visualization from the analytics and optimization domain. In order to support secure access, authentication and authorization functions from within the security domain are covered for human actors accessing the market place as well as for machines talking to the dynamic service gateway.

Referring to the service creation domain illustrated in Figure 6, the IBM Rational tools have been used in order to support the Requirements Analysis and Design, Change Management and Integration Test Processes. As those tools already provide their predefined set of features and use cases, the WP3 team did not describe the requirements on how to gather and organize the use cases, which otherwise would need to be done (see Section 1.3 in the introduction of this Deliverable for methodology).

Last but not least, the actual business services can be either executed as part of the Service Execution Domain within the marketplace or as part of an external domain under the regime of a business partner. Both variations can be demonstrated within Green eMotion.

The detailed descriptions of the services which constitute the core marketplace can be found in the related features and use cases linked at the end of this subchapter.

2.4 Multi Marketplace Interconnection

Green eMotion started with a more or less single market place approach. However there are also other options which take into consideration that there could be more than one market place, offering similar services. Indeed this reflects the current situation on the market. Within different research projects, different market places evolved all with more or less the same aim: To increase interoperability and to boost the market development of electro mobility. Those market places are for example CROME, European Clearinghouse, MobiE. Besides these research oriented offers, commercial offers are available (or in the preparation phase), namely Hubject and GIREVE which target not only the local market. Based on these observations the necessity for a concept to integrate those activities is obvious. To not do so would contradict the initial aim of interoperability and integration. As a logical consequence the interconnection of market places is discussed in the following.

2.4.1 Multi market place general context & overview

The basic set up of the multi market place environment is characterized by the following situation depicted in Figure 1. There are two market places MP1 and MP2. They both contain multiple connected service providers (e.g. EVSEOP) and service requesters (e.g. EVSP). On a higher level there may be a regulatory instance to preserve competition and avoid monopolistic structures. A downside in this scenario is that the providers cannot offer their services to all requestors and, vice versa, requestors cannot access all services provided by all the service providers. Related to the charging and roaming this would imply that an end customer cannot access the whole, but only the infrastructure which is connected to its market place.

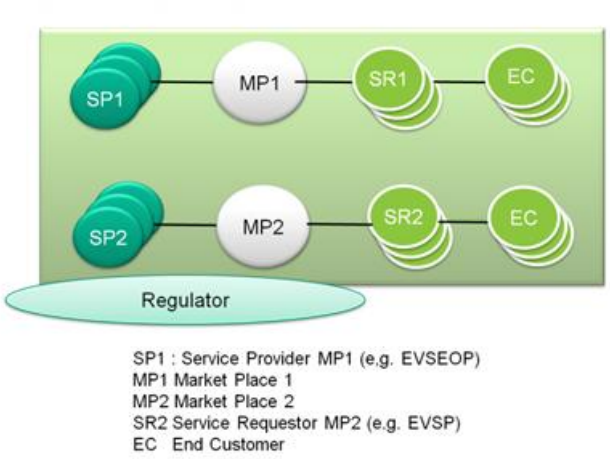


Figure 7: Actors of the multi marketplace environment

The following section discusses the possibilities for integrating such multiple market places. The solution space for this scenario is widespread. Additionally the suitability of the solution may depend on the perspective of the stakeholders. The following steps will be performed: First the requirements of the stake holders are analysed. Based on those assumptions a solution space is built up and evaluated. Finally the use cases and features developed within release 1 of the market place are analysed with regard to the selected multi market place approach.

2.4.2. Requirements of Stakeholders

Figure 7 in the section 2.4.1 above contains all relevant stakeholders. Table 1 below gives an overview of the main identified requirements from each stakeholder group.

Service Provider	• Reach as much requestors as possible. • Easy process (registration, billing, Service management) • (Transparency on the market place) Could be also the opposite requ.
Service Requestor	• Transparency on the market place • Easy process (registration, billing, Service usage) • Have a wide choice of service to use • High quality of service (Evaluation)
Marketplace Operator	• Gaining & maintaining market place share. • Act independently, but also benefit from connections to other MPs. (Could be conflicting requirement) • Advertise own services on other MPs to attract requestors to own MPs (Offer own services but also advertisements/ promotion only)
End Customer	• Broad/ complete set of features/functionality / data (e.g. search charging poles) • Access to all service any time with no restrictions (e.g. location, time, market place) • One stop shopping experience • Seamless change of contract with requestor • High quality of features
Regulator	• Avoid Monopolistic (trust) structures • Keep competition on all levels of the market space

Table 1: Key requirements of the stakeholders connected to marketplaces

It is obvious that the requirements may be easily contradictory. E.g. Transparency on the market place and access to all services is evaluated differently from the provider, market place and requester perspective. Keeping this in mind, some general uses cases were identified to support the analysis of market place integration.

1. A Service Provider connected to market place 1 wants to offer a service to market place 2 E.g. EDF connected to MP1 (CROME) and wants to offer their Charging Stations information to partner on MP2 (Green eMotion market place).
2. A Service requestor connected to market place 2 wants to use a service from market place 1.

E.g. RWE uses the Service from EDF to show EDF charging stations to their customers.

3. After a service is used the transaction data is exchanged between the involved parties. This information serves as a basis for billing and payment transactions between the service provider and requestor. E.g. After a charging transaction, all involved parties get the SDR for billing purposes.

Additionally the following use case domains, (A) Problem Management / Support and (B) Interface harmonisation between market places were discussed but will not be detailed within this document. They are related to the questions: (A) How to identify root causes for transactions failures or problems? How all required information is exchanged to support the (end) customer in an adequate manner? (B) How to achieve a harmonized interface structure to facilitate the implementation of interfaces and to avoid costly integration between different versions and market places?

2.4.3 Architectural options

Based on the use cases, the integration was analysed and two dimensions were identified to be discussed: A) communication and B) contract. The communication dimension refers to how the service provider and the service requester communicate with each other. Whereas the contractual dimension analyses where contractual data is stored to establish a connection between the parties. For each dimension patterns were identified and evaluated.

Communication Patterns

The identified communication patterns mostly reflect different communication paths between the service provider and the service requester. The longest communication path is via the involved market places. Figure 8 illustrates the communication path between the actors.

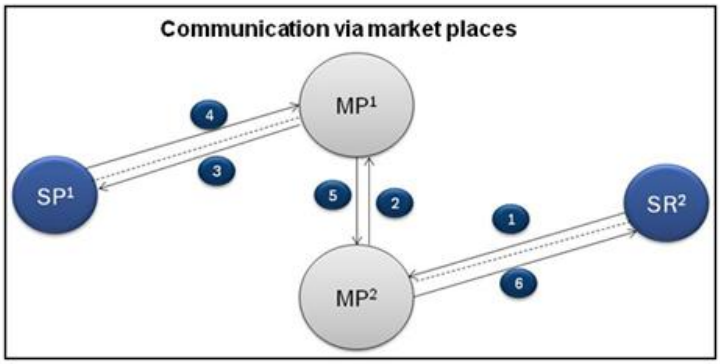


Figure 8: direct communication through marketplaces

A service requester (SR2) asks the market place (MP2) to which he is connected (1). MP2 knowing that this request is served by a service provider (SP1) connected to another market place (MP1) forwards the request to MP1 (2) and MP1 forwards the request to the corresponding service provider (SP1) (3). The answer from SP1 is transmitted the whole path back to SR2 (4-6).
In general a service provider and service requester are connected mainly to one market place, there is no direct connection between them. Nonetheless direct connection would be still possible.
Another communication approach reduces the chain by one. Instead of the connection between the market places, references to services are exchanged between them (0a /0b). So one market place communicates directly with the service provider and service requestor. The communication chain is depicted in Figure 9.

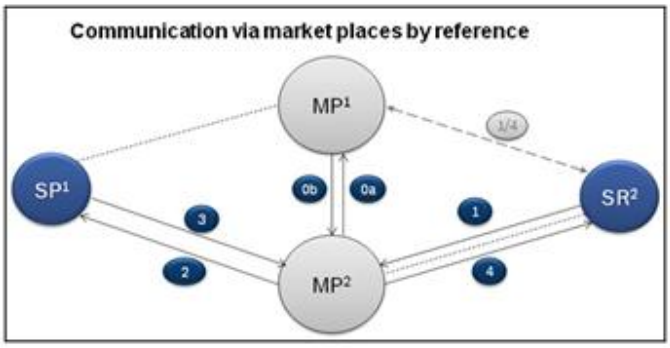


Figure 9: communication through Marketplaces by reference

Alternatively the requester may communicate directly with the market place hosting the provider. In this pattern service provider and / or service requester need to maintain multiple connections to different market places.
To further decrease the communication path length the third option reduces the communication chain again by one. Requester and provider communicate directly with each other. Reference Information about the service addresses or endpoints can be provided either by a market place or via a central repository of available services (see directory service). Figure 10 visualizes those two options. Needless to remark that in both cases, the availability of services must be synchronized in advance (done by a marketplace or the service provider himself; line 1 and 2, or 0a/0b on the right image).

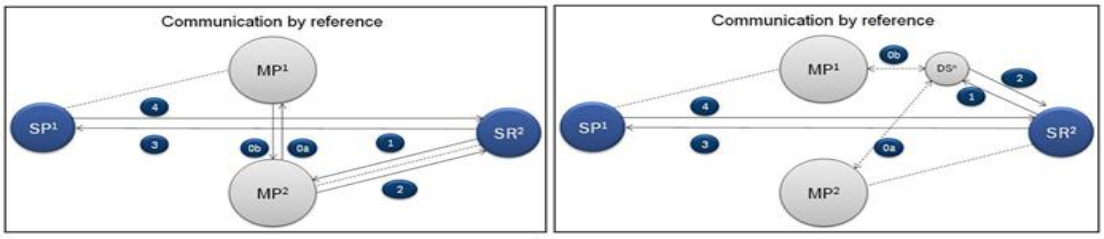


Figure 10: direct communication

The figure does not take into concern that both service provider and service requester need to establish bilateral connections. In other words the number of connections to be maintained corresponds to the number of partners.

2.4.4. Contract Patterns

In addition to the communication patterns, an analysis regarding the question: "Where is the contract information stored?" was performed. The following picture outlines the different contract relations and storage locations possibilities:

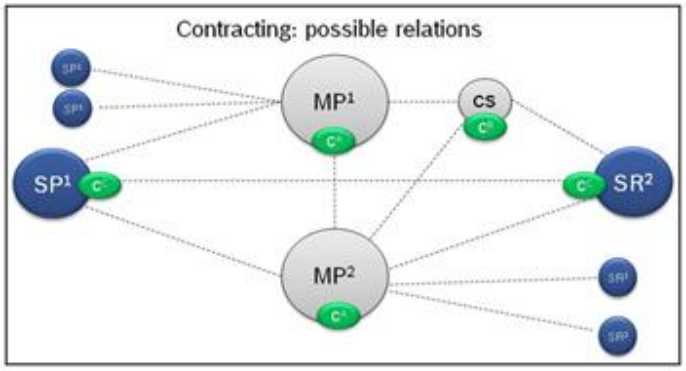


Figure 11: all possible contracting relations

The green "c" indicates possible location where contract information may be stored. This could be either directly at the partner connected to the market place, at the market place or at a central contract service (CS) which hosts the contract relationships between the different parties. Dotted lines present possible relationships between the involved parties, which has an impact on the resulting contract framework which is supposed to be complex especially with regard to liability and service quality.
The most important one is the contract between the service provider and the service requester. Both may have additional contracts with a market place, but this does not influence the relationship between the partners.

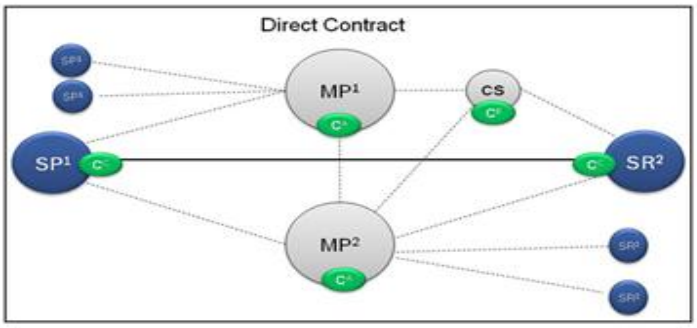


Figure 12: direct contract

However this would result (similar to the communication pattern) in a high number of contracts and especially a high number of different agreements between the different partners what are not visible in Figure 12. With regard to the location it seems to be beneficial to store the information at the end point to increase security and reduce the communication complexity. However central authorization could also be possible.

Another approach is that a market place acts as aggregator for all connected parties. This would standardize the contract between the partners but also limit the flexibility between the service provider and service requester. Additionally the liability aspect gets complex due to more partners being involved. Different contracts must also be considered for a single transaction. Another issue would be that the market place acts on behalf of all connected parties or on behalf of individual parties. The latter would allow at least a certain control for a provider or requester with whom a contract is closed.

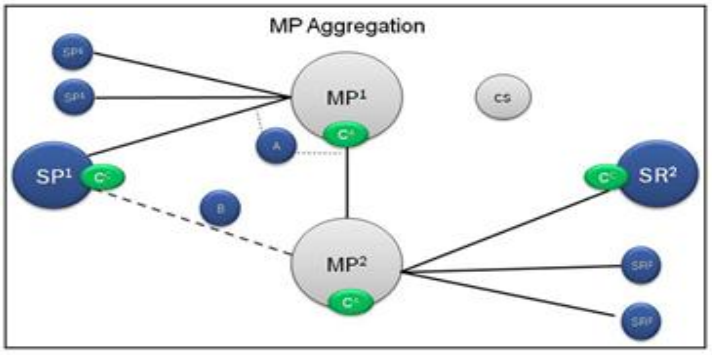


Figure 13: Marketplace aggregation

For the connected service provider and requestor, usually a single contract would be maintained. However bilateral contracts may extend this relationship. As location it seems that in this case the market place should host the contracts to facilitate the interaction. Even if every connected party may maintain its own repository to control the market place.
Similar to the communication pattern also a central instance may serve as contracting service (Directory Service) which allows storing the contracts as well as references to a service. Figure 14 visualizes this.

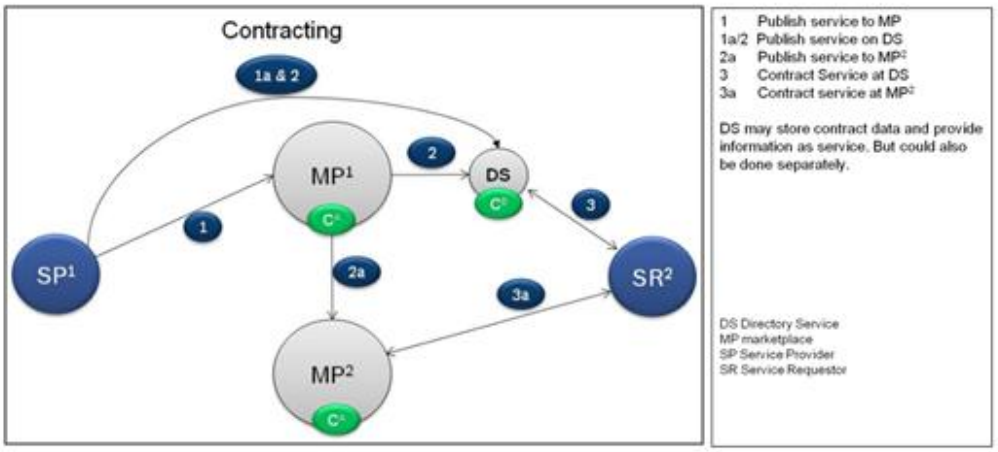


Figure 14: contracting with the use of service directory

The location of the contracts for this approach is obviously in the central repository, however, the involved parties may additionally store their contracts locally to enable and control access to their services.

Beside the demonstrated patterns, mixtures would be also possible, however, the inclusion of these would increase the complexity with no clear benefit.

2.4.5 Analysis and Evaluation of Options

The two highlighted dimensions span a solutions space which may be suitable for all identified use cases. The following table demonstrates this:

Contracting / Communication	Direct Contract relationship	Contract aggregation via the market place	Contracting via a central contracting service
Communication via market places			
Communication via market places by reference			
Communication via reference			

Table 2: Solution space for a multi market place scenario

Basically the dimensions represent variations of the identified use cases, more specifically how a service is offered and consumed. On a high level most of the combinations were judged possible, but it was also assumed that each use case may have its "own" optimal solutions. So, the main challenge remained the evaluation e.g. how to integrate the different stakeholder perspectives and how to evaluate the different variations of each use case. In this context an other dimension was discovered, which is related to the environment. The environment refers to market development and the current state of the industry which is expected to evolve during the next couple of years. These factors may have an impact on the evaluation.

One approach could be to evaluate each use case with regard to the identified patterns, assuming that each use case has its "own" optimal solutions. However due to the number of use cases an evaluation on a higher level seems to be more pragmatic. Based on the identified communication patterns, the main differences are the length of the communication path and the number of connections. The first criteria influence the performance of the connection. The longer the communication path is, the longer the transmission of messages may take. As a conclusion the direct connection is the shortest and therefore the preferred solution.

Considering the second criteria, the number of connections is the highest for the direct connection and the lowest for the communication via marketplaces. The number of connections usually influence the effort to maintain and operate the interface, especially if changes are likely and there is no consolidated stable interface. In the worst case, connections to all involved partners must be managed with different versions and connection methods. This corresponds, more or less, to the current situation on the market. In comparison to the communication via the marketplace, where only one connection must be maintained, the preferred option self evident. Based on these arguments there is no clear preference. However it can be assumed that the stability of the interfaces will increase due to standardization in the near future. In addition to this, the additional effort to for

partners to join will increase the likelihood of participation. Based on these assumptions it is preferable to start with a communication via marketplaces which facilitates the connection of partners to market places and increases the acceptance. As a second step, at a later stage the whole system then may evolve into a direct connection system to increase the performance.

Similar arguments can be brought up for the contractual part. A central version reduces the number of contracts and the complexity to be managed but limits at the same time the flexibility. However any kind of centralized or aggregating contracting service may be quite challenging with regard to liability to the involved parties. So to conclude from a contractual perspective the direct connection would be preferred but to reduce the initial complexity also an aggregated approach seems to be preferred. Combining the two evaluations a market approach would be followed for the communication and contracts. Nonetheless, bilateral contracts are possible.

So with regard to the initial proposed evaluation of each use case it seems that it is sufficient to stay on a high level, however an evaluation will be done if the use cases need to be adopted.

The effect of the multi market place scenario on the feature and use case is widespread but also with a limited impact. In general the multi market place feature is already implicitly part of the feature actor (1762) and Overview (1758) and the business scenario 1177 “BS-S5 Linking of Systems, Standardisation of Interfaces, Messages”.

The major effect is related to the market place core services features and use cases. In general the description must be extended to multiple market places. E.G. for the 1484 UC View Service Details instead of a single service, other services from other market places can be selected and details can be shown. However this does not imply that all services must be available on all market places. This may be desirable from the service requester point of view but not from the market place operator point of view.

Similar adaptations would be necessary for the other features and uses cases of the core market services, always considering the basic uses cases (see also above) and:

- The core services of two market places can be integrated.
- Core services can be used by partners on different market places.

Beside market place core services also general services are affected. Especially if a service on one market place is already available on the other. E.g. Search or clearing house. To allow a broad use of the service one option could be to exchange information between the services or new services evolve which combine the existing ones. E.G: there is one search service on one market place and one search service on another. To receive a consolidated and complete search result, either a) the

two search services use each other to complement their search results, either b) the requester use both services or c) there is a new service using the existing search services to deliver the complete search result.

Due to the relative small and relative structured changes of the use cases, an adaptation of each use case resp. the duplication was judged to be not efficient. Instead a detailed description of the interfaces will be completed for the next deliverable (Service Specification) D3.6.

2.5 Overview and listing of core Marketplace services – Features and Use cases

1315: FTR Register Service
- 1250: UC Register Service
- 1470: UC Create Service Contract Offering
- 1475: UC Search and Select Standard Interface
- 1476: UC View Standard Interface Details
- 1477: UC Create Service Registration Contract
- 1482: UC View Service Contract Template
- 1488: UC Upload Service Content
- 1489: UC Upload Service Specification
- 1494: UC Publish Service

1366: FTR Create Business Partner Account
- 1373: UC Search and Select Business Partner
- 1374: UC Create Business Partner Account
- 1377: UC View Business Partner Account Details

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/Deactivate a Business Partner Account
- 1373: UC Search and Select Business Partner
- 1376: UC Change Business Partner Account
- 1377: UC View Business Partner Account Details
- 1379: UC Activate Business Partner Account
- 1380: UC Deactivate Business Partner Account

1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination
1386: FTR Delete Business Partner Account
1396: FTR Define and Register Service Contract
1470: UC Create Service Contract Offering
1479: UC View Service Contract Details
1482: UC View Service Contract Template
1484: UC View Service Details
1485: UC Create Service Contract
1624: UC Change Service Contract Offering
1397: FTR Prolong Service Contract
1245: UC Search and Select Service Contracts
1246: UC Create Service Contract Change Request
1247: UC Confirm Service Contract Change
1479: UC View Service Contract Details
1443: FTR Enable / Disable Service
1245: UC Search and Select Service Contracts
1255: UC Start/Stop Service
1479: UC View Service Contract Details
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination
1486: UC Enable/Disable Service permanently
1687: UC Notify Service Requesters of own Service
1444: FTR Delete Service
1239: UC Search and Select Services
1245: UC Search and Select Service Contracts
1256: UC Delete Service
1479: UC View Service Contract Details
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination
1486: UC Enable/Disable Service permanently
1445: FTR Define new Standard Interface
1257: UC Propose new Standard Interface
1475: UC Search and Select Standard Interface
1476: UC View Standard Interface Details
1489: UC Upload Service Specification
1493: UC Publish Standard Interface
1446: FTR Search and Select Standard Interfaces
1475: UC Search and Select Standard Interface

1476: UC View Standard Interface Details
1487: UC Download Service Specification
1447: FTR Contracting Service
1239: UC Search and Select Services
1245: UC Search and Select Service Contracts
1478: UC Download Service Content
1484: UC View Service Details
1485: UC Create Service Contract
1487: UC Download Service Specification
1459: FTR Aggregate Service Call Results
1492: UC Aggregate Service Call Results
1469: FTR Suspend/Resume Service Contract
1245: UC Search and Select Service Contracts
1479: UC View Service Contract Details
1490: UC Suspend/Resume Service Contract by Service Requester
1501: FTR Certificate Service
1617: FTR Marketplace - Authentication and Authorization
1618: UC Marketplace - Login
1619: UC Marketplace - Logout
1622: FTR Manage Requests for new Services
1620: UC Search and Select Requests for new Services
1623: UC View Details of Requests of new Services
1625: UC Create Request for a new Service
1626: UC Change Request for a new Service
1627: UC Delete Request for a new Service
1629: UC Create Response on Requests for new Services
1685: FTR Create Notification to Service Requester
1687: UC Notify Service Requesters of own Service
2292: FTR Service Offering allows web service provider as well as consumer
1470: UC Create Service Contract Offering
2293: FTR Service Bundles
1470: UC Create Service Contract Offering
2294: FTR Service Monitoring Dashboard
2333: UC Monitor Services
924: FTR Search and Select Service
1239: UC Search and Select Services
1484: UC View Service Details
926: FTR Call of Service
1241: UC Call of Service

1245: UC Search and Select Service Contracts
1491: UC Create Service Transaction
927: FTR Service Transaction overview
1239: UC Search and Select Services
1242: UC Search and Select Service Transactions
1471: UC View Service Transaction Details
931: FTR Change or Terminate Service Contract
1245: UC Search and Select Service Contracts
1246: UC Create Service Contract Change Request
1247: UC Confirm Service Contract Change
1479: UC View Service Contract Details
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination
935: FTR Provide Service Contract Framework
1482: UC View Service Contract Template
940: FTR Version Service
1239: UC Search and Select Services
1245: UC Search and Select Service Contracts
1246: UC Create Service Contract Change Request
1247: UC Confirm Service Contract Change
1486: UC Enable/Disable Service permanently
1488: UC Upload Service Content
1489: UC Upload Service Specification
1494: UC Publish Service

2.6 Core Marketplace services description – Feature level

1315: FTR Register Service

Any Service Provider can register an EV Service at the GeM 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.

This feature is realized by the following use cases:

1250: UC Register Service
1470: UC Create Service Contract Offering
1475: UC Search and Select Standard Interface
1476: UC View Standard Interface Details
1477: UC Create Service Registration Contract
1482: UC View Service Contract Template
1488: UC Upload Service Content
1489: UC Upload Service Specification
1494: UC Publish Service

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

This feature is realized by the following use cases:

1373: UC Search and Select Business Partner
1374: UC Create Business Partner Account
1377: UC View Business Partner Account Details

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

This feature is realized by the following use cases:

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/Deactivate a Business Partner Account

A registered Business Partner can request an activation of his active account, as well as an activation of his deactive 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

This feature is realized by the following use cases:

1373: UC Search and Select Business Partner
1376: UC Change Business Partner Account
1377: UC View Business Partner Account Details
1379: UC Activate Business Partner Account
1380: UC Deactivate Business Partner Account
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination

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:

1. 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.
2. The Service Requester can choose from the set of Service Contract Offerings and has to accept at least one.

This feature is realized by the following use cases:

1470: UC Create Service Contract Offering
1479: UC View Service Contract Details
1482: UC View Service Contract Template
1484: UC View Service Details
1485: UC Create Service Contract
1624: UC Change Service Contract Offering

1397: FTR Prolong Service Contract

There has to be the capability to prolong existing Service Contracts:

- Automatic prolongation depending on the conditions of the existing service contract.
- Manual prolongation by a Business Partner

This feature is realized by the following use cases:

1245: UC Search and Select Service Contracts
1246: UC Create Service Contract Change Request
1247: UC Confirm Service Contract Change
1479: UC View Service Contract Details

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.

This feature is realized by the following use cases:

1245: UC Search and Select Service Contracts
1255: UC Start/Stop Service
1479: UC View Service Contract Details
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination
1486: UC Enable/Disable Service permanently
1687: UC Notify Service Requesters of own Service

1444: FTR Delete Service

A Service can be deleted by request of the Service Provider.

As precondition the service has to be disabled permanently, i.e. there is no valid Service Contract of this service.

This feature is realized by the following use cases:

1239: UC Search and Select Services
1245: UC Search and Select Service Contracts
1256: UC Delete Service
1479: UC View Service Contract Details
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination
1486: UC Enable/Disable Service permanently

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.

This feature is realized by the following use cases:

1257: UC Propose new Standard Interface
1475: UC Search and Select Standard Interface
1476: UC View Standard Interface Details
1489: UC Upload Service Specification
1493: UC Publish Standard Interface

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.

This feature is realized by the following use cases:

1475: UC Search and Select Standard Interface
1476: UC View Standard Interface Details
1487: UC Download Service Specification

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 Contracts created by the acceptance of the Service Contract Offering.

This feature is realized by the following use cases:

1239: UC Search and Select Services
1245: UC Search and Select Service Contracts
1478: UC Download Service Content
1484: UC View Service Details
1485: UC Create Service Contract
1487: UC Download Service Specification

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.

This feature is realized by the following use cases:

1492: UC Aggregate Service Call Results

1469: FTR Suspend/Resume Service Contract

The Service Requester can suspend/resume his own Service Contracts.

Suspended Service Contracts will not be taken in account during service calls.

But the Service Contract remains still valid.

This feature is realized by the following use cases:

1245: UC Search and Select Service Contracts

1479: UC View Service Contract Details
1490: UC Suspend/Resume Service Contract by Service Requester

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.).

This feature is realized by the following use cases:

1618: UC Marketplace - Login
1619: UC Marketplace - Logout

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 fulfil the Request, i.e. to implement the Service and offer it on the marketplace.

This feature is realized by the following use cases:

1620: UC Search and Select Requests for new Services
1623: UC View Details of Requests of new Services
1625: UC Create Request for a new Service
1626: UC Change Request for a new Service
1627: UC Delete Request for a new Service
1629: UC Create Response on Requests for new Services

1685: FTR Create Notification to Service Requester

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

This feature is realized by the following use cases:

1687: UC Notify Service Requesters of own Service

2292: FTR Service offering allows web service provider as well as consumer

As soon as a business partner provides some sort of service, he becomes a service provider from a business point of view.

The business service provider will be the party which actually develops a business component and in many cases this component will expose service interfaces to the outside world in order to enable others to use that service. Those interfaces might cover user interfaces for interactions with human beings as well as machine to machine interfaces. The machine to machine interfaces can be offered and contracted through the market place.

By exposing a web service through a business component, this component becomes a web service provider and passively waits for a web service consumer to contact it in order to perform its service.

In such a case the party which creates the Service Offering does this in a specific category which defines the message structure or defines a message structure if it does not refer to a Standard Interface. The endpoint of the service to be called belongs to the business component of the creating party and needs to be defined as part of the Service Offering at creation time.

However, in some cases the party which creates the Service Offering does not want to expose an interface and become a web service provider, but rather requires the requesting party which closes the contract to do so. Inheriting a message structure from a Standard Category or creating on follows the same rules as in the example above, while in this case the creating party does not define an endpoint for the service. Instead the other party which closes the contract needs to ultimately define their endpoint.

Example: Somebody wants to offer a web service monitoring service. In order to do so he creates a Service Offering and defines a message structure for a simple ping message. The party who offers the monitoring service needs to create a business component which performs the actual monitoring, while the ping service itself needs to be implemented and exposed by each monitored system - in other words by each party which contracts the monitoring service.

Note: In combination with feature 2293 a whole set of service bundles covering a mixture of web service providers and consumers can be created.

This feature is realized by the following use cases:

1470: UC Create Service Contract Offering

2293: FTR Service Bundles

A Service Offering created by a Service Provider can contain more than on service from different categories.

As a consequence one contract covers the whole bundle of services.

The attributes on Service Offering or Contract level (e.g. start date, end date, status) as well as the user defined attributes like price information and other terms and conditions are valid on that level for the whole bundle of services.

All use cases operating on the contract level should affect all contained services (e.g. a successful contract termination makes all services unavailable, there are no such thing like unbundling or operations which affect only a subset of the services). Use cases which do operate on service level are not being affected by this feature.

Note: In combination with feature 2292 a service bundles can cover a mixture of web service providers and consumers.

This feature is realized by the following use cases:

1470: UC Create Service Contract Offering

2294: FTR Service Monitoring Dashboard

The Service Monitoring Dashboard allows to monitor the actual service execution through the Dynamic Service Gateway.

The key facts include but are not limited to

- number of successful calls
- number of failed incoming calls
- number of failed outgoing calls
- number of outgoing calls with invalid response
- number of outgoing calls with no response
- elapse time within DSG for request
- elapse time within DSG for response
- response time for outgoing calls
- ...

Broken down into the following dimensions/levels

- Time (Total, Year, Month, Day, Hour...)
- Provider (Total, Individual)
- Requester (Total, Individual)
- Service (Total, Category, Offering, Contract)

Depending on the KPI, different aggregation functions need to be used on aggregated levels:

- numbers must be added
- times must be averaged, min, max and sum could be applied on top

Result should be available as flat list in CSV-format for download.

Result could be displayed as slice through a multidimensional data cube.

Result could on top be visualized through appropriate diagrams.

Notes:

All success and failures are counted in respect to the DSG boundaries. Messages which do not reach the DSG because they are intercepted by firewalls or similar components before the DSG itself are not taken into account in those statistics. If required they must be obtained by other means from the intercepting components.

A call is successful if it can be processed through DSG and the response can be processed on its way back as well. If something goes wrong along the chain, the call will be accounted to one of the other cases depending on where it went wrong.

A failed incoming call might be triggered by a malformed message, wrong parameters or no valid contract. A failed outgoing call might be triggered from a system which could not be reached.

An invalid response is one which is malformed, while no response includes responses which come to late (timeout).

This feature is realized by the following use cases:

2333: UC Monitor Services

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.

This feature is realized by the following use cases:

1239: UC Search and Select Services
1484: UC View Service Details

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.

This feature is realized by the following use cases:

1241: UC Call of Service
1245: UC Search and Select Service Contracts
1491: UC Create Service Transaction

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)

This feature is realized by the following use cases:

1239: UC Search and Select Services
1242: UC Search and Select Service Transactions
1471: UC View Service Transaction Details

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.

1. The first Business Partner requests unilateral contract change or termination by the other Business Partner
2. This action is reported to both Business Partners.
3. 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!

This feature is realized by the following use cases:

1245: UC Search and Select Service Contracts
1246: UC Create Service Contract Change Request
1247: UC Confirm Service Contract Change
1479: UC View Service Contract Details
1480: UC Create Service Contract Termination Request
1481: UC Confirm Service Contract Termination

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).

This feature is realized by the following use cases:

1482: UC View Service Contract Template

940: FTR Version Service

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

This feature is realized by the following use cases:

1239: UC Search and Select Services
1245: UC Search and Select Service Contracts
1246: UC Create Service Contract Change Request
1247: UC Confirm Service Contract Change
1486: UC Enable/Disable Service permanently
1488: UC Upload Service Content
1489: UC Upload Service Specification
1494: UC Publish Service

Chapter 3: General E-mobility Services

3.1 Introduction

As already described in D3.3 there are two interacting layers of scenarios forming this domain. It is the layer of basic and enhanced charging scenarios related to functionality as well as the layer of charge locations which is divided into charging at residential premises, semi public (in offices, shopping centres) or public (at curb side). These two groups of scenarios can be represented by 2 axes with each charging related service being positioned in this matrix:

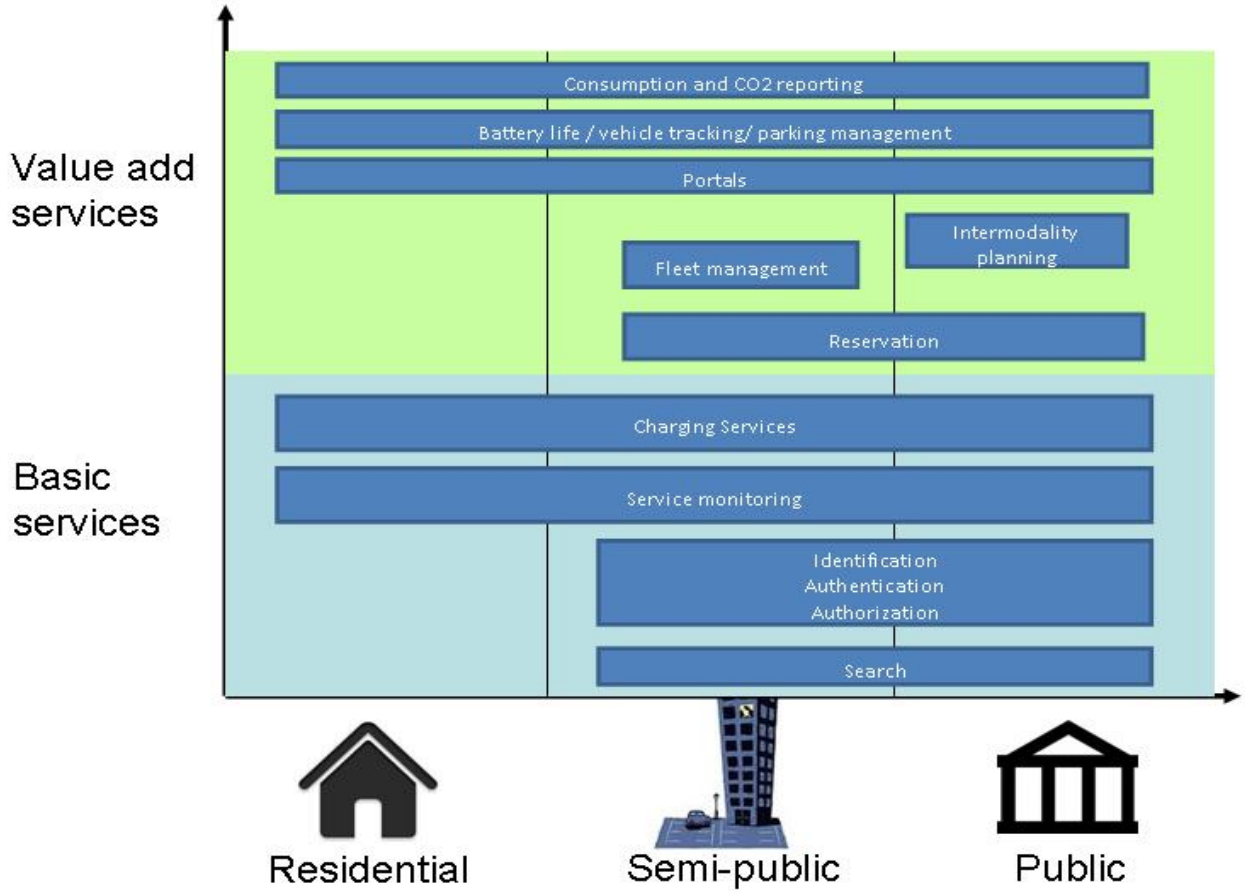


Figure 15: Categorization of general e-mobility services by added value and location

All three charging location scenarios have a common time sequence of interaction between the EV driver and the EV IT systems (EVSE backend, EVSP system, Clearinghouse, Marketplace) and

have been described as before charging, during charging and after charging throughout these scenarios. The three categories explain the chronology of the charging domain from an end user perspective which enhances the understanding of each pre-condition and successful outcome. Before charging describes a sub-set of more detailed use cases taking place before the user plugs in to charge. This is mainly related to services like searching for charge spot and making a reservation. During charging describes a sub-set of more detailed use case taking place as the user identifies oneself physically at the charge spot and throughout the entire charge session. After charging describes a sub-set of more detailed use cases taking place when the user ends a charging session by plugging out and beyond.

Due to a large amount of services described in this domain, we have in this chapter elaborated more detailed overviews of the significant ones, based on the several rounds of prioritization among GeM partners. The full list of features and use cases in this domain can be found in the next chapter.

3.2 Basic services

From the functionality perspective, one of the most important aspects within the category of value added services described and demonstrated through the GeM Marketplace is the EV driver's capability to find and reserve a public or semi-public charge pole. In addition to the basic search, which allows the driver to find charge poles (basic charge services), there is a multitude of enhancements such as the ability to check the availability for reservation, type of payment as well as commercial offers related to the use of the EVSE. Services around search and reservation are described and in Green eMotion implemented by Siemens. These extended functionalities are described in the new and enhanced use cases within the scope of this deliverable. The following section summarizes the final description of the services "Search of EVSE / Advertising" and "Reservation of EVSE". The final text of the features and use cases is listed in a later section of this document.

Search for EVSE (and Advertising)

An EV driver wants to search for an EVSE location in order to increase range of the vehicle. The goal of this service is to enable the EV driver to select from multiple recharging attributes and filter his search.

In order to be able to search for EVSE based on filter parameters, the user will need to first identify himself (Login) and than search. The business objects defined in the D3.5 deliverable, such as User identification (EVCO-ID), enhancement of search (e.g. show only EVSEs, where free charging is possible) will be used to realize the service.

Criteria for search of the EVSE include attributes of the EVSE connection points such as:

• Geographical information (e.g. planned location for travel / reservation)
• Actual availability status (e.g. free, occupied, reserved, out of order)
• Type of charger: (e.g. 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)
• Access: membership, open access
• EVSE-Operator: e.g. RWE, Better Place
• Price: Per kWh, per hour parking, fixed fee etc.

The search function can be supported from different end-user applications. The GeM demonstration includes search frontends developed by WP3 partners. Smart Phone (e.g. iPhone, Android) application is demonstrated in Denmark. Internet customer portal interfacing this service is demonstrated in Germany, France and Italy. In-Car application in an onboard-unit of the vehicle is to be demonstrated by Betterplace in Denmark.
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) can be delivered to the EVSP-backend-system.

For advertising the search result should include relevant commercial offers related to the EV-Driver preferences and planned charging time. This can also include interactions with charge & ride services or car-sharing models.

The advertising related information have to be selected and approved / blocked by the EVSP, which triggers the appearance of the offers on EV drivers desired media and means of communication (on board unit, sms, EVSE display, etc.) based on the preferences agreed on in the EVSP customer service contract.. From the B2B perspective the allocation to the relevant EVSE mapping to the advertising it is inevitable to be done based on geographical parameters.

EV Driver portal
Use of EV has to be enabled to the end users through a user friendly interface. In this deliverable the high level business requirements for a portal allowing EV drivers to easily interact with their service provider are described. This portal would be operated by an EVSP and used by the driver. The EV driver portal could have the form of a website or a mobile application. Functions that an EV Drivers may use to manage key activities in their electric vehicle usage include functionalities such as mobile phone identification at EVSE, and Search and reserve EVSE mapped to GIS, filtering them by Location and Status,.
The homepage of such a portal would display general information, such as:
• Announcements, press releases
• Available Rates and Programs

• FAQ, tutorials
• Commercial offers (Charge Posts accessories)
• Connection to social media and benchmarking

Transaction history of EV accounts and RFID cards assigned to accounts will also by enabled by the web portal as well as management of own account and RFID cards. View of transactions and corresponding charges (details and analysis of all financial information related to EV driving) will be displayed as well in this part of the portal.
Energy information section of the portal will show in different Graphical representation the Electricity consumed / fed into the grid as well as enabling the EV driver to choose the profile of charging (charge now, later, optimized, etc.)

3.3 Value added services

Enhanced charging services describe a range of value added features that Green eMotion partners offer through the Marketplace to their business clients. Overviews of all enhanced charging features and use case specifications are described in the next chapter.

Reservation of EVSE
In addition to the search function described in the basic charging services, the Reservation of EVSE is divided into two categories based on the time between the search / reservation and the reserved time of charge into short term (acute) and mid - long term.

The EVSP backend will identify and check the authorization of the EV-End-user. Identification of the EV-End-user should be done by the EVCO-ID.

Via the EVSP backend the EV End user will enter the search criteria (e.g. address, plug-type, reservation-time) for the reservation of the requested EVSE.

The service “Reservation of EVSE” will then check, based on the static and dynamically EVSE data provided by the EVSE-backend, if the requested Reservation-search can be fulfilled and then reply with the search -result.

The EV-end user will select from the search result the relevant EVSE and Time (hourly). It is possible to reserve at least one hour up to several days.

For the communication of the successful reservation the service “Reservation of EVSE” will send a confirmation to the EVSP-backend system. EVSP backend system has to pass the confirmation and its related information to the EV driver, the end user.

The reservation-logic will be based on the EVSE-Pools (described in D3.5), which are sent as part of the master-data from each EVSE-backend system, and this logic will automatically inform the EVSE-backend when the configured reservation time is scheduled - this includes also the maximum duration for the show up time.

Within the reservation logic there are the following options possible:

- Point in time reservation
- For the point in time reservation, the EV-driver have to start the charging exact (time-range +- 15 min, configurable) to the requested reservation start time. When the EV will disconnect from the EVSE, the reservation is expired.
- Reservation period
- For the reservation period, the EV driver can arrive within the registered reservation time period, the EV-driver can also disconnect and connect the EV without consequences on the reservation, that means also in this case the reservation is still valid.

Afterwards the Reservation can be displayed or cancelled by the EVSP backend system from the EV-end-user.
It is possible to include payment-functionality within the reservation process, this have to done by integration of a payment-interface by the EVSP-backend. This functionality, however, is not planed to be demonstrated in the second release.
For Controlling of the realized and planned reservation, the service will support the EVSP with a standard reporting.
The following chapter describes features and use cases specifying the business requirements for the system to provide search and reservation services through the GeM Marketplace.

Signal inappropriate parking
The detection of the EV dedicated parking lot is crucial in big cities since EV parking lots are often taken by non Electric Vehicle, which represents an obstacle to accessing both reserved and non reserved EVSEs. An EVSE is able to detect improper parking by an ICE vehicle setting a time out from the instant the vehicle is parked to the instant a charging session begins. If a charging session is not started in 3 minutes, it deduces that the vehicle is an ICE. After detecting a No EV, the EVSE can inform the EVSE Operator Back End and a request for towing the car can be sent to the police.

B2B billing
The use case B2B Billing describes how billing can be enabled between two business partners on the Marketplace. The service is based on an underlying roaming contract between the two partners

including a pricing scheme, master data about each partner from the registration on the Marketplace as well an accumulated set of SDR/CDR data collected from each transaction on the Marketplace.

Car information

In order to enable scenarios such as intermodal planning and fleet management, it is important to have additional car information available. The user should get access to car information items as "state of charge", technical/ performance data (for example a certain range), usability (for example space- in case the user has certain requirements regarding space and/ or trunk capacity). The car information data would be submitted from the car's on-board-unit to the manufacturer's backend-system via GSM. From there, a standardized interface would provide the relevant (and released) information for specific applications on the GeM marketplace.

In detail, for the current status the following information should be available for the user: actual state of charge and remaining range of the vehicle as well as the type of tires mounted (summer/winter) and possible pre-heating/ pre-cooling options.

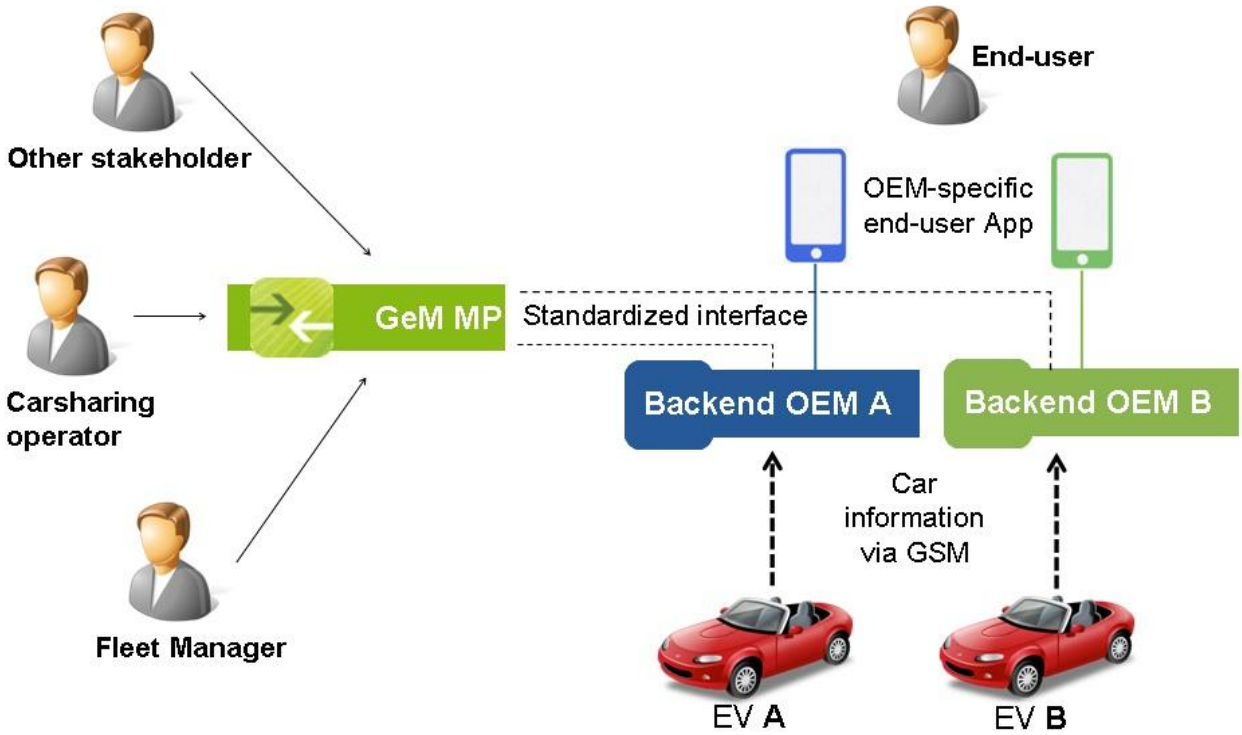


Figure 16: Car information contextual diagram

As for the technical and performance data, the user would be interested in the predicted range (minimum, average and maximum), as well as in the charging time, the maximum battery capacity and the equipment of the car with a range extender. Furthermore, the user might be interested in acceleration and top-speed of the car and whether it's a 2-wheel-drive or a 4-wheel-drive.
In terms of usability, the user might be especially interested in the number of seats, number of doors, trunk-capacity and maximum load capacity of the car. Furthermore, safety features and the possibility to mount a roof box should be displayed. Even comfort-equipment such as air condition, seat heating, Sat-navigation, internet-access and audio-system options might be of interest to the user. There are other EV service provider roles interested in car information data, as for example a fleet manager, who's in charge of a fleet of EVs. It is essential for the resource-planning to know about the recent status of charge and range of the cars to allocate a certain car to a user having a specific mobility-requirement. Knowing about each car's charging-curve would enable the fleet manager to plan charging according to electricity tariffs, avoiding peak-load times of the grid. A car sharing-operator, would as well be interested in allocation of the cars, but might focus on authorization and billing.

Intermodality planning

Intermodality planning is a value-add service designed to provide a traveller with an itinerary for an intermodal passenger transport journey including different means of transport (e.g., EVs, bus, train, taxi, plane, bike). In the context of Green eMotion the EV driver is considered to be central and shall be enabled to determine the best transportation routes based on the user's travel request and his or her personal preferences.

In order to move around effectively EV drivers need to easily find and use EVSEs. There are several types of EVSEs with multiple recharging attributes (the services "Search of EVSE/Advertising" as well as "Reservation of EVSE" discuss this basic service in more detail). However, most of the EVSEs still have one attribute in common: apart from fast-charging poles and battery-switch-stations EVSEs require a significantly longer time to recharge than fuelling up a combustion vehicle at a petrol station. While this may be sufficient for many occasions, there are other situations that this given condition does not satisfy. In those instances it may be the most appropriate action to park the EV at an EVSE while continuing the journey with other means of transport. The intermodality planning services enhances the "Search of EVSE" as it not only navigates the EV driver to the EVSE of his choice but also determines the best transport option to go on with and eventually reach the final destination ("Park & Charge & Ride"). This chapter summarizes the required functions of an EV intermodality planning service and describes its use cases.

UC Search for intermodal transport application

The EV driver enters the final destination and the desired time of arrival into the intermodality application that has recourse to the user's profile and his/her preferences (e.g. refusing a certain mode of transport). Considering the current location of the traveller and his/her current mode of transport (e.g., EV, walking) the intermodality application searches for Parking/EVSE location close to final destination respectively along the route with possibilities to interchange to other means of transport. If the user initiates the request while driving the EV the application should also consider the battery's current stage of charge, its discharge profile (remaining range) as well as its charging profile (time to recharge battery). Based on that information, the application searches for Parking/EVSE locations which satisfying all requirements (e.g., contract authentication and payment method, type and mode of charging, availability) and also offer nearby public transport connections. Hence, the resulting "Park & Charge & Ride" alternatives are displayed to the user including their total travel time, estimated time of arrival, and total cost of transportation. Inputs required for this computation are static information (e.g., EVSE location) as well as dynamic information (real-time public transport information).

UC Select and reserve intermodal transport:

The EV driver is able to reserve a charge pole and connecting transportation through the intermodality application. Subsequently to the search for intermodal transport, the EV driver is displayed the best search results and able to select the desired route. Once the user has made its choice, the reservation request is submitted to the EVSE operator of the selected parking/charging station as well as to all other means of transport chosen, provided that reservation is offered (e.g., Car sharing, train). The reservation request shall implicate the EVCO ID and for reservation of EVSEs also the expected time of arrival. The EVSE operator processes the request and the EV driver receives a confirmation if the reservation has been processed successfully. Normally, the EVSE operator will guarantee that the charge pole is reserved for the user for a certain period of time in which the EV driver is expected to arrive at the EVSE. In an enhanced version of this use case, the EV driver could also pay for the connecting modes of transport. However, this would require the integration of the EVSP account with the municipal/transport payment systems. If the public transport systems do not allow this function, the user will be informed and prompted to make additional purchases at the respective point of sale.

UC Navigate to destination of intermodal transport

This use case offers navigation assistance to EVSE and connecting transportation through the intermodality application. After confirming the selection and reservation of the route the EV driver is directly navigated to the next connection point (EVSE or public transport station). The navigation service can either be directly integrated into the intermodality application (i.e. through Google Maps) or alternatively just provide the GPS information of the destination.

If the user starts his journey with other means but his EV (which may be parked at charge pole) the application navigates the user to the next and nearest connection point (e.g. bus stop, car sharing point). The user is also always able to locate his EV through vehicle tracking (via smartphone).

Portal to manage EVSE network

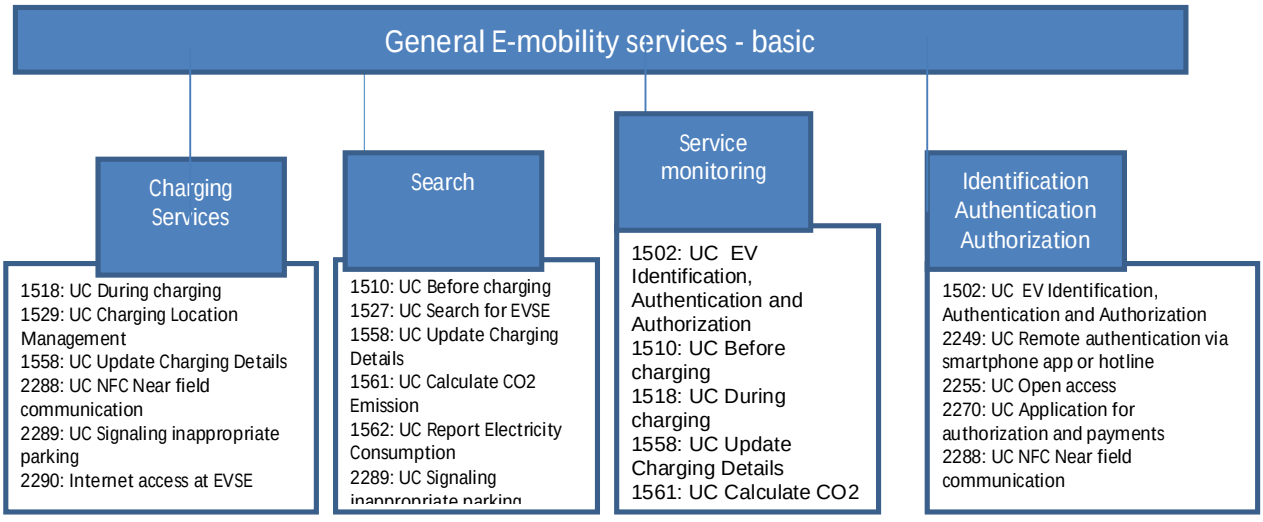
Another topic related to charging that has not been described in the first release yet is the ability of EVSE operators to manage their charge poles. The layout and functions of such portal would encompass the following functionalities:

Homepage would provide basic statistics of the EVSE network (utilization of the CP network such as histograms and analytics), and several views of the charge poles including an aggregated view of the CPs in a region , aggregated User Views, total number charge transactions, and other which will be specified.

Other sections of the portal could include maintenance, Energy flows information, Financial flows and other.

3.4 Overview and listing of General e-mobility services - Features and Use Cases

The following section features a simplified graphical overview showing a logical structure of all general e-mobility use cases described in this chapter. Full structure of use cases together with the list of the features they are realizing is listed below. The list of features and use cases is more detailed and does no fully match the graphical overview.



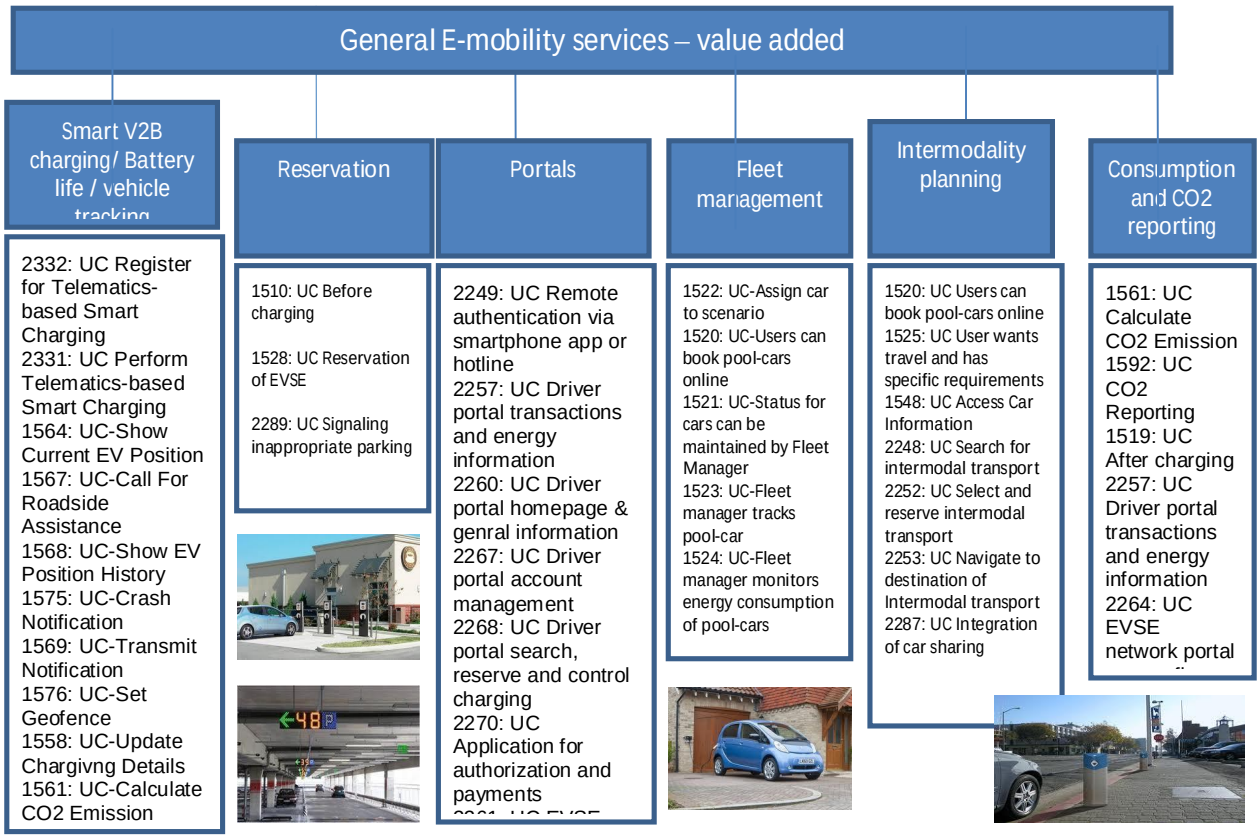


Figure 17: overview of general e-mobility features and use cases

2322: FTR Electric Vehicle Awareness
- 2323: UC Probe data collection
- 2324: UC Journey analysis
- 2325: UC Assessment of usage pattern

1300: FTR Car information
- 1548: UC Access Car Information

1301: FTR Fleet management
- 1520: UC Users can book pool-cars online
- 1521: UC Status for cars can be maintained by Fleet Manager
- 1522: UC Assign car to scenario
- 1523: UC Fleet manager tracks pool-car
- 1524: UC Fleet manager monitors energy consumption of pool-cars

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
- 2248: UC Search for intermodal transport
- 2252: UC Select and reserve intermodal transport
- 2253: UC Navigate to destination of Intermodal transport
- 2269: UC Responding to incidents
- 2287: UC Integration of car sharing

1309: FTR Charging management
- 1518: UC During charging
- 1529: UC Charging Location Management
- 1558: UC Update Charging Details
- 2288: UC Direct Payment w and w/o service contract on multi-vendor charging infrastructure
- 2289: UC Signalling ICE vehicle inappropriately parking
- 2290: UC Internet access at EVSE

1318: FTR Reservation of EVSE
- 1510: UC Before charging
- 1528: UC Reservation of EVSE
- 2289: UC Signalling ICE vehicle inappropriately parking
- 2302: UC Reservation of EVSE for EMI3

1320: FTR CO2 intensity of driving
- 1561: UC Calculate CO2 Emission
- 1592: UC CO2 Reporting

1808: FTR Find Appropriate Charge Point / Battery Station
- 1510: UC Before charging
- 1527: UC Search for EVSE
- 1558: UC Update Charging Details
- 1561: UC Calculate CO2 Emission
- 1562: UC Report Electricity Consumption
- 2289: UC Signalling ICE vehicle inappropriately parking
- 2301: UC Search for EVSE for EMI3

1812: FTR EVSE Service Monitoring
- 1502: UC EV Identification, Authentication and Authorization
- 1510: UC Before charging
- 1518: UC During charging
- 1558: UC Update Charging Details
- 1561: UC Calculate CO2 Emission

1562: UC Report Electricity Consumption

2258: FTR Driver portal
- 2249: UC Remote Authentication / Push Authorization
- 2257: UC Driver portal transactions and energy information
- 2260: UC Driver portal homepage & general information
- 2267: UC Driver portal account management
- 2268: UC Driver portal search, reserve and control charging
- 2270: UC Application for authorization and payments

2259: FTR EVSE network portal
- 2261: UC EVSE network portal homepage view charge poles
- 2264: UC EVSE network portal energy flows
- 2265: UC EVSE network portal financial information
- 2266: UC EVSE network maintenance portal

2329: FTR Telematics-based Smart Charging
- 2331: UC Perform Telematics-based Smart Charging
- 2332: UC Register for Telematics-based Smart Charging

944: FTR Vehicle tracking
- 1523: UC Fleet manager tracks pool-car
- 1564: UC Show Current EV Position
- 1567: UC Call For Roadside Assistance
- 1568: UC Show EV Position History
- 1575: UC Crash Notification
- 1576: UC Set Geofence

970: FTR Consumption monitoring
- 1519: UC After charging
- 2257: UC Driver portal transactions and energy information
- 2264: UC EVSE network portal energy flows

979: FTR Identification, contract Authentication and Authorization (front-end)
- 1502: UC EV Identification, Authentication and Authorization
- 2249: UC Remote Authentication / Push Authorization
- 2255: UC Open access
- 2270: UC Application for authorization and payments
- 2288: UC Direct Payment w and w/o service contract on multi-vendor charging infrastructure

3.5 Description general e-mobility services – Feature level

2322: FTR Electric vehicle awareness

One of the major objectives of the Green eMotion project is to analyse the operability of electric cars under real-life conditions in order to promote the mass adoption of electro mobility. With the development of the virtual marketplace, Green eMotion has become the driving force behind the seamless introduction of electro mobility in Europe. Yet, to achieve mass adoption it is essential to increase customer awareness for electro mobility and to overcome the concerns of more reserved drivers with respect to EV battery capacity and EV usage. The electric vehicle awareness application is designed to meet potential concerns around electro mobility by monitoring the personalized driving patterns of internal combustion engine vehicles' drivers over a period of time and then compare it to the potential use of an electric vehicle for exactly the same usage pattern. The results of these observations will be based on extensive data collection and used to draw comparisons between CO2- fuel – and cost savings as well as travel times for traditional combustion engines as opposed to electric vehicles. Consequently, this could be used to entice undecided potential buyers as they realize the potential savings with little or no impact on their traditional usage behaviour. This could also be leveraged as an effective sales tool for OEMs offering EVs since comparisons could be based on specific models chosen by the user. Moreover, OEMs and other partners gain invaluable insights into driving patterns and will therefore be able to create more personalized offers to their customers.

This feature is realized by the following use cases:

2323: UC Probe data collection
2324: UC Journey analysis
2325: UC Assessment of usage pattern

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.

This feature is realized by the following use cases:

1548: UC Access Car Information

1301: FTR Fleet management

The fleet management feature is a superset of different features which should support 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

This feature is realized by the following use cases:

1520: UC Users can book pool-cars online
1521: UC Status for cars can be maintained by Fleet Manager
1522: UC Assign car to scenario
1523: UC Fleet manager tracks pool-car
1524: UC Fleet manager monitors energy consumption of pool-cars

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 travellers to determine the best transportation combinations based on the user's travel request and his or her preferences.

Mobile application would enable EV drivers to search select, reserve and navigate (optional) to a desired final destination, including the possibility to park/charge the EV along the route if applicable. EV driver using public transport could also get access to EV car sharing/taxi stations along the stops of public transport.

EV driver is able to select a route based on several criteria. Intermodal route planning would also take into account the status of the battery, range, estimated traffic situation at time of departure and desired time of arrival as data inputs and resulting options would be filtered by criteria such as time to destination, total cost, CO2 footprint, types of plug, types of authentication of payment, etc.

In order to achieve the highest value-add for EV drivers it is desired to avoid missed connections (when using public transportation) or unavailable resources (e.g. no available charge poles, no available shared cars etc.). In order to do so, it is necessary to include risk and uncertainty into the journey planning when determining the best route. It might for instance be preferential to pick a route that takes insignificantly longer than another but with significantly less risk to undergo a negative impact (e.g. failure to catch connecting transport due to minor delay).

This feature is realized by the following use cases:

1520: UC Users can book pool-cars online
1525: UC User wants travel and has specific requirements
1548: UC Access Car Information
2248: UC Search for intermodal transport
2252: UC Select and reserve intermodal transport
2253: UC Navigate to destination of Intermodal transport
2269: UC Responding to incidents
2287: UC Integration of car sharing

1309: FTR Charging 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.

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

Charging management ensures the 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

Additional 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.

The feature also 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

Charging can be modified (load increase / decrease) either directly by the User or by the EVSE Operator, depending on the (residential) location and business model.

Control over the Charge Point is exercised by means of Charge Point Management, an element of Charging Location Management

Both for Charging Services and for Battery Switching, Control of the Service is governed by either a specific or (minimum) a default Service Level Agreement which dictates:

- the minimum service to be provided e.g.
    - always supply at least enough power to reach the nearest fast charger or battery switch station
    - guaranteed timeslot & power level to charge
    - guaranteed battery replacement time

- optional terms and conditions for **Priority Charging**
  - can be requested by EV driver
  - uses communication to EVSE Operator, e.g. Smartphone App, SMS, EV Telematics, telephone call
  - must be approved or denied by EVSE Operator
  - includes approval/denial message to EV Driver
- optional exclusion or eligibility for **Low Priority Charging** (ref. Energy Services)
  - results in lower charge or prolonged charging period
  - can be initiated by EVSE Operator, EVSP or third party
  - benefits Electricity Grid stability
  - may be compensated financially
- optional terms and conditions for Roaming (ref: Roaming Services)
- optional terms and conditions for value added services

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

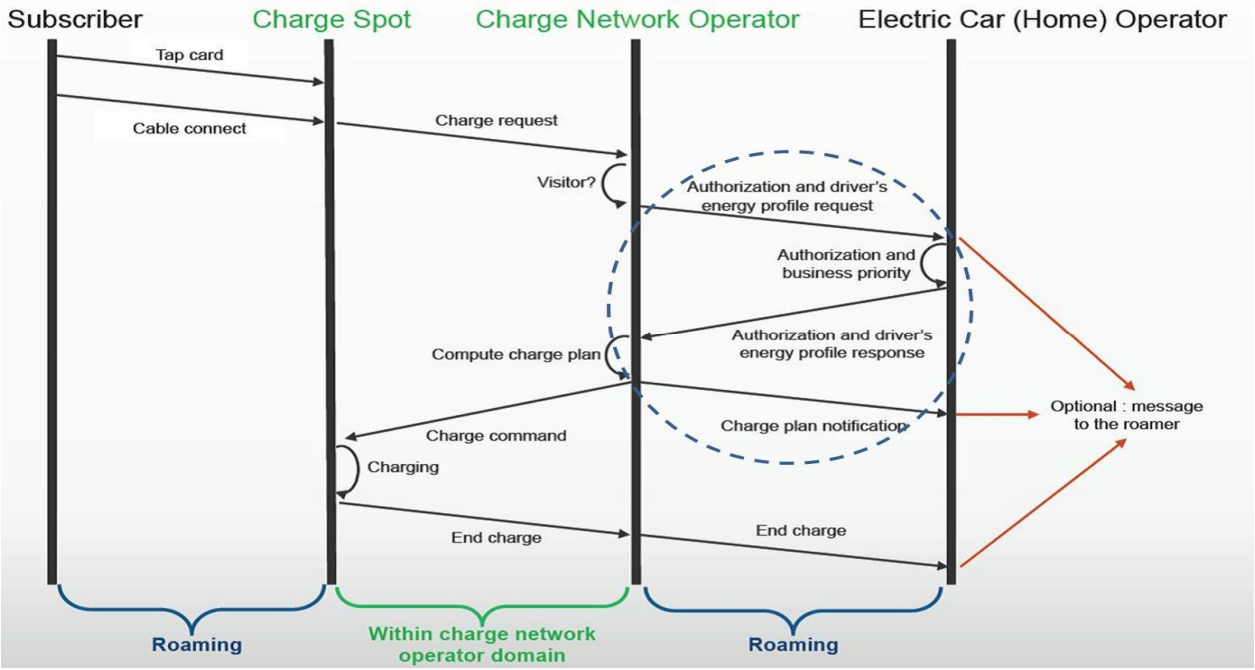


Figure 18: Authentication and authorization sequence diagram (Betterplace)

Service delivery. Services to repower the EV at the EVSE location.

Depending on the available infrastructure and the choice of the Driver, one of two services may be delivered:

- Connect-Charge-Disconnect
    1. A user parks his car by a charge point
    2. The user identifies himself with a compatible ID (RFID, scan, phone call to customer service center etc.)
    3. The user is authenticated and can connect the car to the charging with a compatible charge cable
    4. 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
    5. User is authorized or not for charging. If not, the charging is interrupted and the user is notified
    6. 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
    7. User disconnects car from charge point
- Battery Switch Service
    1. A customer identify himself with RFID or alternative user identification
    2. The telematics system instructs the user to park the car correctly in the switch station
    3. Upon correctly parking an automated process takes over the car positioning, washing and battery switching
    4. The telematics system informs the user when the automated switch process is over and the car can be removed from the switch station

The Delivery of Service is governed by either a specific or (minimum) a default Service Level Agreement which dictates:

- the minimum service to be provided (e.g. always supply at least enough power to reach the nearest fast charger or battery switch station)
- optional terms and conditions for Priority Charging (ref. EVSE Service Control)
- optional exclusion or eligibility for Low Priority Charging (ref. EVSE Service Control, also ref. Energy Services)
- optional terms and conditions for Roaming (ref: Roaming Services)
- optional terms and conditions for value added services

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

This feature is realized by the following use cases:

1518: UC During charging
1529: UC Charging Location Management
1558: UC Update Charging Details
2288: UC Direct Payment w and w/o service contract on multi-vendor charging infrastructure
2289: UC Signalling ICE vehicle inappropriately parking
2290: UC Internet access at EVSE

1318: FTR Reservation of EVSE

This feature of reserving 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

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

Detailed description:

The end-user search for charging pools. The result can be filtered by search criteria. Search criteria can be defined either by the end user or the abstract user interface. (see also UC 1527 "Search of EVSE", FTR 978 "Search for EVSE or battery switch station"), that means the reservation ca be triggered based on the search UC/FTR mentioned before.

The EV Driver can select a single pool in order to receive detailed information for this or directly reserve one EVSE from the EVSE-Pool.

Optional will the EV Driver receives a confirmation of the reservation via Email or SMS, this task have to be fulfilled by the EVSP-Backend system.

Each scenario can provide follow-up functionality (like "show details", reservation, routing, "add to my favourites") for each charging location on the list, map.

The following pool-grouping rule applies without any additional configuration:

If the pool ID (i.e. group Id) of a charging point is not maintained then the service will

group this with any other EVSEs that have the same address.

Reservation functionalities:

The reservation service will send the reservation request to the relevant CMS system. The reservation request will include the

- EVSE-Pool ID or/and EVSE-ID

- EVCO-ID from the EV-End-user

- Reservation-Time

- Show-up-Time

Charging time configuration description:

Based on charging type (AC|DC|…) it must be configured how long a charging session takes (from authentication until removing the plug)

The configuration parameter is a first assumption for planning purposes how long the charging session will be. For example an AC session is configured for 4h. The reservation module will assume a charging session duration of at least 4 hours and will block this time frame. no reservations will be possible during this time frame.

For the communication of the successful reservation the service “Reservation of EVSE” will then send a confirmation to the EVSP-backend system. The information of the EV-end user has to proceed by the EVSP backend.

The reservation-logic will be based on EVSE-Pools (send in the master-data from the EVSE-backend) and automatically inform the EVSE-backend when the configured reservation time is scheduled, this include also the maximum duration for show up time.

Within the reservation there are the following options possible:

- **Point in time reservation**
- For the point in time reservation, the EV-driver have to start the charging exact (time-range +- 15 min, configurable) to the requested reservation start time. When the EV will disconnect from the EVSE, the reservation is expired.
- **Reservation period**
- For the reservation period, the EV driver can arrive within the registered reservation time period, the EV-driver can also disconnect and connect the EV without consequences on the reservation, that means also in this case the reservation is still valid.

Afterwards the Reservation can be displayed or cancelled by the EVSP backend system from the EV-end-user.

It is possible to include payment-functionality within the reservation process, this have to done by integration of a payment-interface by the EVSP-backend.(This will not be demonstrated within Rel. II)

For Controlling of the realized and planned reservation, the service will support the EVSP with a standard reporting

Reservation within the charging-process:

An EV-End-user can charge at a charging point.

In case a charging point is reserved, the user identification must match the identification set in the reservation. A charging session can then be started. The session must be synchronized with the reservation. After session end the reservation ends or stays valid until the specified reservation end.

There is a business requirement of integration of confirmed reservation in Outlook calendar.

This feature is realized by the following use cases:

1510: UC Before charging
1528: UC Reservation of EVSE
2289: UC Signalling ICE vehicle inappropriately parking
2302: UC Reservation of EVSE for EMI3

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* :

- 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 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.

*) Requirements are subject to implementation and may vary from the hereby suggested procedure

This feature is realized by the following use cases:

1561: UC Calculate CO2 Emission
1592: UC CO2 Reporting

1808: FTR Find Appropriate Charge Point / Battery Station

This feature allows a driver to find a charge point or battery stations that satisfies his needs.

The feature is accessible from multiple devices, including but not limited to:

- on-board device
- smart phone app
- EVSP, EVSE, OEM or third party website / portal
- customer service hotline

The feature provides an ordered (suggested / prioritized)list of facilities.

The list is based upon driver selected, optionally preset parameters, including but not limited to:

- Localisation, such as
  - Predefined Geographic Areas (ref. Geofencing)
  - specified distance(s) to current position, current route, intermediate / final destinations
  - extra mileage to use facility
- matching EV and EVSE (infrastructure) capabilities, such as
  - AC charging,
  - DC charging,
  - battery switching
- Cost parameters, such as
  - Price of Electrical Power
  - Other cost components (e.g. Parking Fee)
  - CO2 footprint /Electricity Source

    - Elapsed Time needed
- Usability parameters, such as
    - availability window
    - possibility to reserve timeslot
    - congestion management properties (ref. Energy Domain)

Note: the format for infrastructure capabilities, and the API to retrieve these, are yet to be defined

This feature is realized by the following use cases:

1510: UC Before charging
1527: UC Search for EVSE
1558: UC Update Charging Details
1561: UC Calculate CO2 Emission
1562: UC Report Electricity Consumption
2289: UC Signalling ICE vehicle inappropriately parking
2301: UC Search for EVSE for EMI3

1812: FTR EVSE Service Monitoring

Charge Point Status registration is exercised by means of Charge Point Management, an element of Charging Location Management

Data can be routed through the EVSE's or the EVSP's backend system, or the EV's on board system may be allowed to tap into the Charge Point Management data directly.

The data is made available to **the EV-driver** in real time and/or at the termination of charging,

This information can be supplied through various interfaces, such as (but not limited to)

- Smartphone apps,
- EVSP / EVSE Operator / OEM portals / website,
- on-board device
- SMS

Data may include various details, such as (but not limited to)

- current rate of charging
- time to completion
- current kWh price

- CO2 equivalent
- last energy consumption

In addition, at the end of the Charging Process, charge data such is uploaded to complete payment, reporting and (optionally) Roaming processes.

This data is includes the elements as mentioned above, plus identification details such as EV / EV User ID, SLA, Car Capabilities.

This feature is realized by the following use cases:

1502: UC EV Identification, Authentication and Authorization
1510: UC Before charging
1518: UC During charging
1558: UC Update Charging Details
1561: UC Calculate CO2 Emission
1562: UC Report Electricity Consumption

2258: FTR Driver portal

This feature describes functions of a portal that an EV Driver can use to manage key activities around his use of electric vehicle.
The homepage of this portal would display general Information, such as:

- Announcements, press releases
- Available Rates and Programs
- FAQ, tutorials
- Commercial offers (Charge Posts accessories)
- Connection to social media and benchmarking

Tabs of the EV driver portal would comprise sections such as Search and reserve EVSE mapped to GIS, filter them by Location and Status, Transaction history of EV account and RFID cards assigned to this account, view of transactions and corresponding charges (details and analysis of all financial information related to EV driving). Management of own account and RFID cards, and electricity consumed / fed into the grid (Graphical representation.

This feature can be realized both as a web portal and mobile application.

This feature is realized by the following use cases:

2249: UC Remote Authentication / Push Authorization
2257: UC Driver portal transactions and energy information
2260: UC Driver portal homepage & general information
2267: UC Driver portal account management
2268: UC Driver portal search, reserve and control charging
2270: UC Application for authorization and payments

2259: FTR EVSE network portal

The EV market has a multitude of EVSE manufacturers and small operators without access to their own portal. Small businesses focus on a functional backend system, and not on its usability, which can be expensive. This feature summarizes functions of a portal that would enable even a small operator of EVSE to view and manage its network efficiently.

Homepage would provide basic statistics of the EVSE network:

- Aggregated view of the CPs in a region
- Aggregated User Views
- Utilization of the CP network (histograms, analytics)
- Total number of customers

Other sections of the portal would include:

Maintenance

- schedules
- work orders
- other

Energy

- Network throughput of energy volumes in time[kWh]
- Peak and average throughput [kWh] by time blocks
- Historical peaks (Day, Hour, Year) line graphs
- Real Time consumption of the viewed EVSE
- Forecasted consumption of the viewed EVSE

bFinancial

- Revenue per view
- Utilization of viewed EVSE

This feature is realized by the following use cases:

2261: UC EVSE network portal homepage view charge poles
2264: UC EVSE network portal energy flows
2265: UC EVSE network portal financial information
2266: UC EVSE network maintenance portal

2329: FTR Telematics-based Smart Charging

Controlled charging of the vehicle battery over wireless networks makes integration of electric vehicles into the power grid easy and efficient. This is one of the main requirements in Green eMotion to demonstrate "smart charging" of the electric vehicle in order to reduce peaks in the grid and increase the usage of renewable energy. The driver typically uses a smart phone to set his preferences and then the process of "smart charging" is started. It is either controlled via:

1. EV to EVSE communication as defined in ISO15118 (or)
2. EV to OEM backend (Vehicle-to-backend V2B) communication.

This feature relates to option 2 and enables controlled charging using a "dump" power outlet, either at home or at work locations. The Telematics-based smart charging does therefore support the most essential locations for EVs for the next years. The V2B communication enables many other features and use-cases, such as:

- Routing, navigation services based on the "battery-state-of-charge" information
- Battery diagnostics based on the battery information
- and many others.

This feature is realized by the following use cases:

2331: UC Perform Telematics-based Smart Charging
2332: UC Register for Telematics-based Smart Charging

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

This feature is realized by the following use cases:

1523: UC Fleet manager tracks pool-car
1564: UC Show Current EV Position
1567: UC Call For Roadside Assistance
1568: UC Show EV Position History
1575: UC Crash Notification
1576: UC Set Geofence

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

This feature is realized by the following use cases:

1519: UC After charging
2257: UC Driver portal transactions and energy information
2264: UC EVSE network portal energy flows

979: FTR Identification, contract Authentication and Authorization (front-end)

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/IEC 15118).The feature involves the following:

- Driver uses a EVCOID to access EVSE
- If the EVSE recognizes the EVCOID, either as customer or roamer, access is given

- EVSE starts charging the car
- If the EVSE operator cannot validate the EVCOID, charging will be interrupted

Depending on the EVSE infrastructure and the capabilities of the EV, the methods of identifying a user differs.

The figure below classifies possible scenarios:

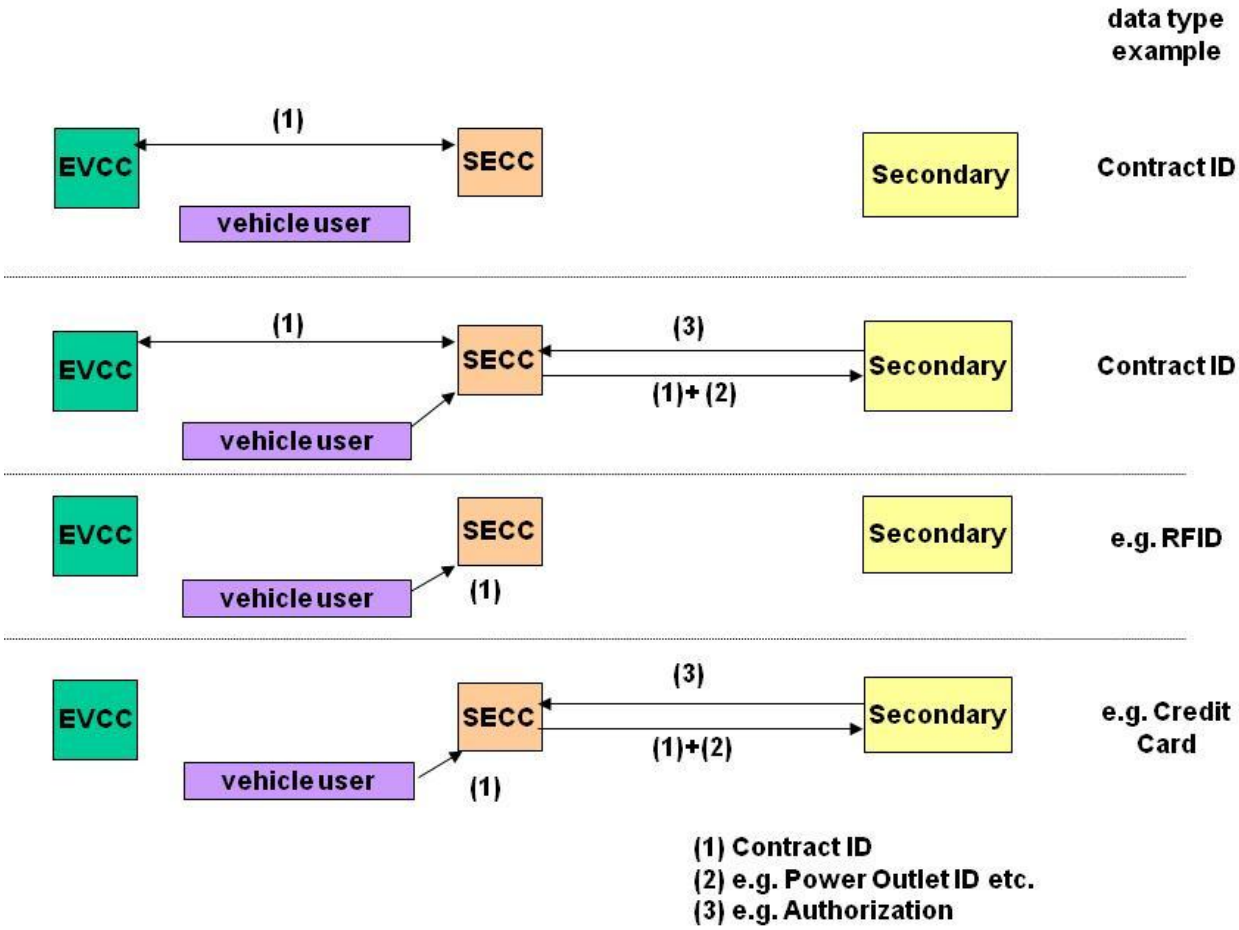


Figure 19: User Identification Scenario, Source ISO 15118-1

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

This feature is realized by the following use cases:

1502: UC EV Identification, Authentication and Authorization
2249: UC Remote Authentication / Push Authorization
2255: UC Open access
2270: UC Application for authorization and payments
2288: UC Direct Payment w and w/o service contract on multi-vendor charging infrastructure

Chapter 4: Roaming

4.1 Introduction

In Green eMotion the focus in the roaming scenario remains on contractual clearing. Financial clearing, which deals with consolidated rating and billing, is already available in other industries and can be applied analogously in the electric vehicles market, however not demonstrated in this project. With the focus on contractual clearing, the definition of roaming can be summarized as:

Roaming of EV related services occur 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. Consumer A does not need an additional contract with provider C.

To support the roaming scenario, dedicated roaming services have to be in place. Roaming services can be handled in a bilateral agreement between an EVSE operator and an EVSP or with a clearinghouse to handle the contractual clearing between the EVSE operator and the EVSP.

The use cases in this deliverable will show the need for authorization means either directly on the charge point or via a mobile application as well as the need for a standardized way of transferring data records about the service usage to the respective service partner. Additionally the contractual relationships have to be handled in a way that they are accessible in order to confirm them if necessary.

The use cases described in the next chapter are all related to the charging process of an electric vehicle. Other uses of the Clearing house might in the future include services such as parking or data services and could also be utilized by the roaming domain. These use cases are however not demonstrated in the Green eMotion project.

4.2 Authorization

The Authorization (UC 1512) can be triggered in different ways. The most common way at the current point in time is the use of an RFID card illustrated in Figure 20.

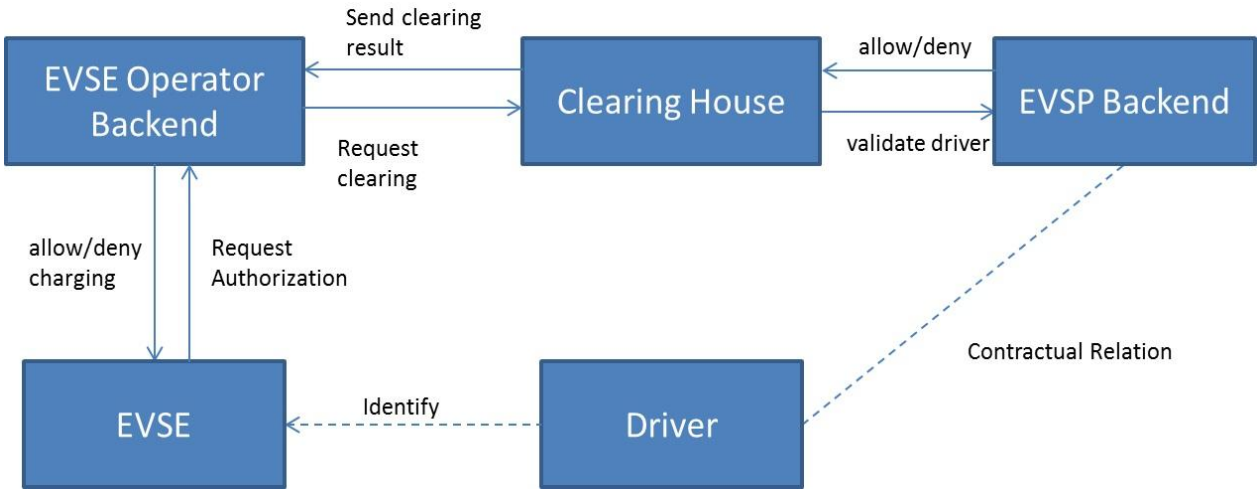


Figure 20: Authentication via RFID card

The driver swipes his card over the RFID reader on the charge point. A white or blacklist function implemented within the EVSE backend can be used inside the EVSE in order to perform a pre-check for a particular card. If the RFID card number is in a white list, the charging process can start immediately. The RFID card number on a black list would lead to an instant denial of the charging. Should the RFID card number not be included in such a list, the charge request is forwarded to the corresponding EVSE operator backend which controls the EVSE. The same white/black list concept can again be applied in the EVSE operator backend. That would most probably be the case if the EVSE operator is also an EVSP or has some maintenance or master cards for his infrastructure. Instead of using the RFID card ID itself, an EVCOID, which will be included in the RFID content, may be used to identify the user. This concept is already used by some companies. The same EVCOID will be part of the ISO 15118 where the compatible car will trigger the authorization. If the RFID card number or the EVCOID respectively is not in such a white/black list, and thus unknown to the EVSE operator, his backend will forward the charge request directly to the EVSP in case of bilateral roaming agreements or to the clearinghouse in case of centralized roaming agreements. From this point in time, we can be sure, that roaming takes place. The before mentioned process can and will also happen for authorization of non-roaming charging processes.

The information about the drivers' EVSP is part of the EVCOID. Based on the RFID card ID the EVSP cannot be concluded. Here a translation service has to be in place which can reside within the clearinghouse. In this case, the clearinghouse receives the authorization request with the RFID card ID and translates it to the corresponding EVCOID.

The clearinghouse then performs the contract validation for B2B contracts between the corresponding EVSE operator, which forwarded the request to the clearinghouse, and the EVSP of the EV-driver. The contractual relationship between business partners can be stored in the clearinghouse directly or by another entity. In the GeM setup, the B2B contracts are concluded and stored on the marketplace which provides the needed information to the clearinghouse. If a valid B2B contract is in place, the B2C contract is validated next. Therefore, the clearinghouse can check its own database or ask the corresponding EVSP. Each EVSP needs to have a system in place to receive those messages and react accordingly. Based on the B2B and B2C validation, the clearinghouse will send a roaming acceptance or rejection back to the EVSE operator backend where the charging request came from.

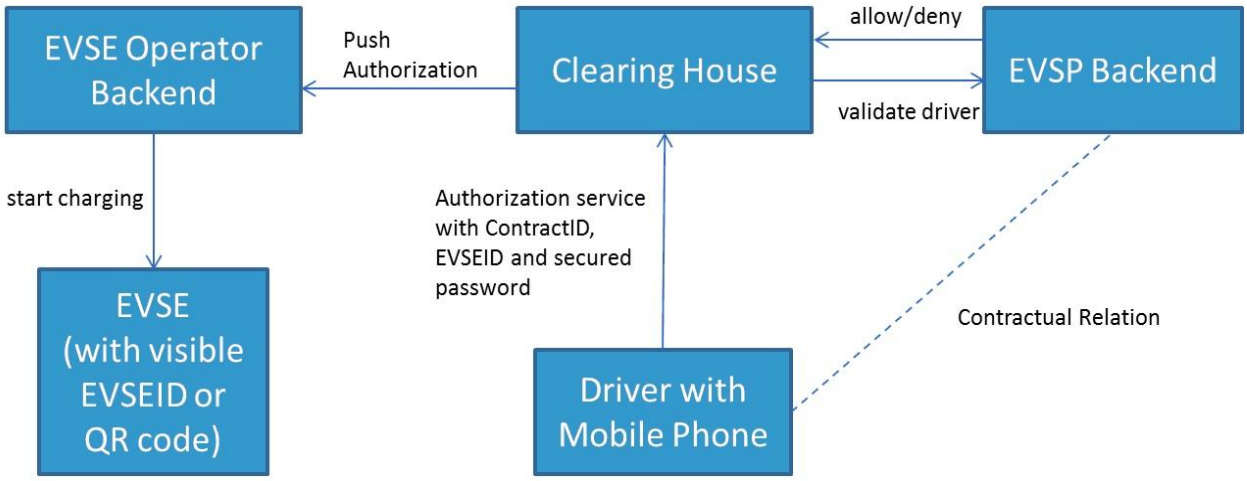


Figure 21: Authentication via Smartphone (Clearinghouse application)

Besides the identification with RFID card, Green eMotion supports another way of triggering the authorization for a charging process. Some charge points don't have a RFID reader and some EVSPs don't hand out RFID cards to their customers. Still, the EV-drivers want to charge at the non-RFID charge points and some drivers without RFID card also want to use charge points which require a RFID card. In that case, the authorization use case (UC 2249) starts with a smartphone, or a web application, [app]. The driver, who wants to charge at a charging point which has no RFID card reader, opens his app and enters his EVCOID, password and the EVSEID at which he is going to charge. The first two parameters, EVCOID and password should possibly be stored in the app's customer profile in order to improve the user experience and speed-up the authorization process. The logon information could either be sent to the clearinghouse or directly to the responsible

EVSP's backend. The latter is most probably the way bigger EVSPs, such as BMW, will prefer the dataflow. In this case, the EVSP can directly assess the situation for the customer at the particular charge point. The home EVSP of the EV driver validates whether the customer has a valid contract which allows roaming on that charge points of the given EVSE operator and if the EVSP has a valid roaming agreement with the EVSE operator where the customer wishes to charge. After a positive assessment, the EVSP would send an authorization instruction to the clearinghouse which will forward this instruction to the corresponding EVSE operator so that he can start the charging process. Should the smartphone application send the logon information to the clearinghouse instead, which is depicted in Diagram 2, the regular authorization process is triggered. The clearinghouse would perform the B2B validation and would check its own database or asks the EVSP for B2C validation. After a positive validation, the clearinghouse would send the instruction to start the charging process to the EVSE operator. In this case the app would be a global clearinghouse app which would not be provider specific. The clearinghouse app approach is expected to be used by smaller EVSPs which don't find it feasible to develop a mobile application in order to allow their customers to charge at charge points of roaming partners.

Open access
Open Access describes a mode of access to charging services. Open access means that the charging can be accessed by any user with a technically compatible car and cable irrespectively of the contractual relationship between the EVSE operator and user. This allows the user to spontaneously access charging. The service is paid for instantly as the service is being consumed. Starting such a charging sessions itself does not necessarily involve a transaction via the Marketplace, however, the user would need the information about which charge spots that offer open access when searching for charge spots.

4.3 Data Records

A charging process produces a data record in which for example the amount of consumed kilowatt hours as well as start and end of the charging process is noted. In case of roaming the responsible EVSP of the driver who charged, might want this information in order to charge his customer. So the EVSE operator has to send the data record to the EVSP. This starts with the end of the charging process which can be triggered by the vehicle, the driver, the charge point or the EVSE operator backend. In all cases the EVSE operator backend sends the corresponding service data record (SDR) to either the EVSP in case of bilateral agreements or the clearinghouse in case of centralized agreements. In case of the latter, the SDR is then validated and forwarded to the EVSP which is responsible for the customer who charged his car. As already mentioned the SDR is not solely for the charging data but could also be used for parking data or other services which were consumed. (UC 1511)

4.4 Contract Information

EVSPs which participate in a clearinghouse to let their customers consume services from other partners have to be somehow registered at the clearinghouse. In Green eMotion the global registration happens at the marketplace where the clearinghouse can retrieve the needed information from. As already noted above, the B2B contracts are also conducted and stored on the marketplace. The B2C contracts, between drivers and their EVSPs, are not necessarily handled centralized. As described in the Chapter ‘Authorization', the clearinghouse can ask the EVSP about its customers and the respective contract information. In order to allow a faster response by the clearinghouse to the EVSE operator, the EVSP can decide to store the relevant customer data in the clearinghouse. As soon as an EVCOID is stored in the clearinghouse, no additional request to the EVSP has to be performed by the clearinghouse. This procedure saves time compared to the additional request and allows for a quicker decision of the EVSE operator to grant or deny the charge request at the EVSE. (UC 1515, UC 1515, UC 1516) In order to enhance the usability of maintaining the roaming EVCOIDs by the clearinghouse, an interface for EVSPs needs to be in place that would create, read, update and delete EVCOIDs. It is clear that each EVSP can only see and modify its own EVCOIDs. This transaction and all other transactions with the clearinghouse have to be secure. Confidentiality, integrity, availability, authenticity, and non-repudiation as key concepts of the information security have to be established between the Clearinghouse and its interfacing parties.

4.5 Overview and listing of Roaming services - Features and Use Cases

The following section shows a simplified graphical scheme structuring all roaming use cases we identified and thought worthy of describing in detail. Some use cases of deliverable D3.3 were improved based on the one year experience we made during specification, implementation and test phase. Full scheme with use cases and the features that they are categorized by are listed below.

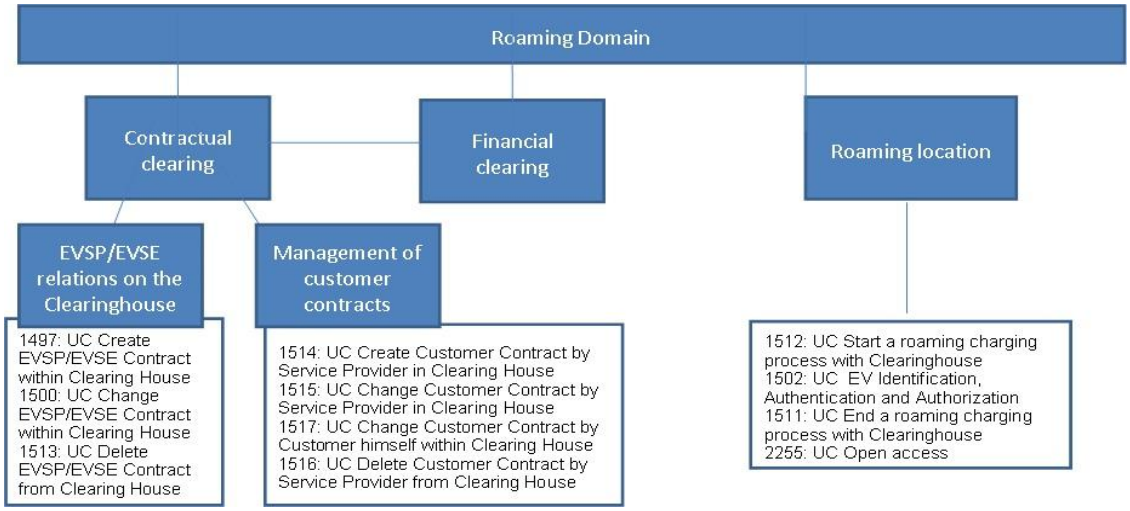


Figure 22: Overview of the Roaming services

List of the Roaming Features and Use cases:

1291: FTR CLEARING Managing EVSP data
- 1497: UC Create EVSP/EVSE Contract within Clearing House
- 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

981: FTR Authentication in the roaming process (back-end)
- 1502: UC EV Identification, Authentication and Authorization
- 1512: UC Start a roaming charging process with Clearinghouse
- 1518: UC During charging
- 2249: UC Remote Authentication / Push Authorization

982: FTR CLEARING Validation of contract
- 1497: UC Create EVSP/EVSE Contract within Clearing House
- 1512: UC Start a roaming charging process with Clearinghouse
- 1514: UC Create Customer Contract by Service Provider in Clearing House

983: FTR CLEARING Managing customer data
- 1512: UC Start a roaming charging process with Clearinghouse
- 1514: UC Create Customer Contract by Service Provider in Clearing House
- 1515: UC Change Customer Contract by Service Provider in Clearing House
- 1516: UC Delete Customer Contract by Service Provider from Clearing House
- 1517: UC Change Customer Contract by Customer himself within Clearing

984: FTR CLEARING Forwarding CDR / SDR
- 1511: UC End a roaming charging process with Clearinghouse

985: FTR Roaming in same country using Clearing House
- 1502: UC EV Identification, Authentication and Authorization
- 1511: UC End a roaming charging process with Clearinghouse
- 1512: UC Start a roaming charging process with Clearinghouse
- 1518: UC During charging

986: FTR Roaming in different countries using Clearinghouse
- 1502: UC EV Identification, Authentication and Authorization
- 1511: UC End a roaming charging process with Clearinghouse
- 1512: UC Start a roaming charging process with Clearinghouse
- 1518: UC During charging

4.6 Description of Roaming services - Feature level

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.

This feature is realized by the following use cases:

1497: UC Create EVSP/EVSE Contract within Clearing House
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

981: FTR Authentication in the roaming process (back-end)

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 contract 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.

This feature is realized by the following use cases:

1502: UC EV Identification, Authentication and Authorization
1512: UC Start a roaming charging process with Clearinghouse
1518: UC During charging
2249: UC Remote Authentication / Push Authorization

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.

This feature is realized by the following use cases:

1497: UC Create EVSP/EVSE Contract within Clearing House
1512: UC Start a roaming charging process with Clearinghouse
1514: UC Create Customer Contract by Service Provider in Clearing House

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.

This feature is realized by the following use cases:

1512: UC Start a roaming charging process with Clearinghouse
1514: UC Create Customer Contract by Service Provider in Clearing House
1515: UC Change Customer Contract by Service Provider in Clearing House
1516: UC Delete Customer Contract by Service Provider from Clearing House
1517: UC Change Customer Contract by Customer himself within Clearing

984: FTR CLEARING Forwarding CDR / SDR

A Charge Detail Record or Service details record (CDR or SDR) is generated for each charging event that goes through the clearing house. At the end of a charging process, the CDR/SDR is sent from the EVSE operator backend to the clearing house. The clearing house validates the CDR/SDR and transmits it to the EVSP that serves the EV driver that is related to the charging event.

This feature is realized by the following use cases:

1511: UC End a roaming charging process with Clearinghouse

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 (provided that EVSP B plays a role of an EVSE Operator). 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 behaviour will be the same inside a single country.

This feature is realized by the following use cases:

1502: UC EV Identification, Authentication and Authorization
1511: UC End a roaming charging process with Clearinghouse
1512: UC Start a roaming charging process with Clearinghouse
1518: UC During charging

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 behaviour between countries.

This feature is realized by the following use cases:

1502: UC EV Identification, Authentication and Authorization
1511: UC End a roaming charging process with Clearinghouse
1512: UC Start a roaming charging process with Clearinghouse
1518: UC During charging

Chapter 5: Energy

5.1 Introduction

The energy use cases that have been described within the deliverable D3.3 aim at providing the ICT infrastructure fundamentals to enable value creation and value transfer among stakeholders with regards to the integration of EVs into the LV/MV grid.

Within the energy industry, the DSO is a key actor given that is has to assure the quality of the energy distribution service as set by each country's regulatory framework, which becomes a greater challenge when EVs are massively rolled out and connected to the grid.

To achieve its objective and keep the power quality within the prescribed boundaries at all times, the DSO can either connect bilaterally or via the Marketplace to EVSE operators to request active demand services as specified in the energy use cases within D3.3.

Other energy stakeholders, such as TSOs and Energy Retailers, may connect to the Marketplace and request D3.3 energy services analogously to the DSO. Currently these interactions are not described or demonstrated in WP3 as no TSOs or Energy Retailers are GeM partners, but it is intended to describe the basis of the interactions with these stakeholders thorough the existing DSO requirements listed in the next chapter.

Figure below, which is an extract of D4.2, shows the time-dimension of the energy scenario evolution envisioned within Green eMotion and aligned to WP3 developments.

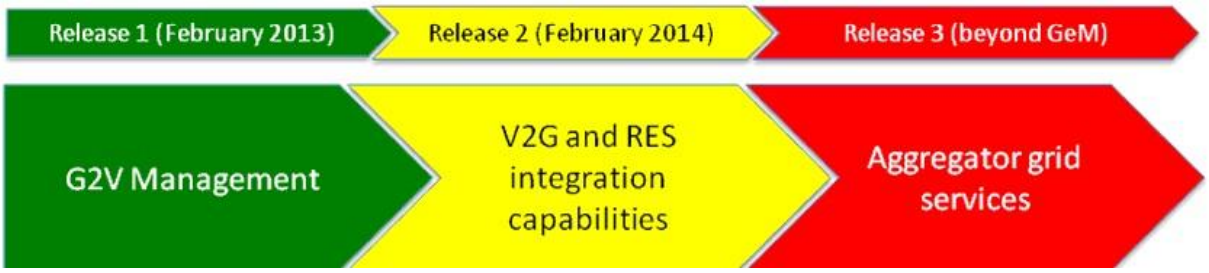


Figure 23: timeline of energy services development

The focus of Release 1 developments within WP3 (May 2011 - February 2013) for the energy domain has been towards two main categories of services:

1. Execution of congestion and load management by the EVSE Operator. This category lies within the Large scale load management, meaning the exchange of the availability of EVs flexible loads (no V2G) from the EVSPs or EVSE operators to the DSO, which will utilize this flexibility based on its requirements for the improvements of energy distribution in terms of reactive power, phase balancing and ancillary services;

2. Data interaction with the energy management to provide information in regards to EVSE usage, state of charge of EVs at each point in time and target peaks ad predefined by DSOs for each Load Area.

Release 2 (demonstrated February 2013 - February 2015) developments are based on the grid, recharging infrastructure and electric vehicles V2G capabilities to enhance G2V services and improve the system ability of integrating renewable energy. The aim of WP3 Release 2 is to define the ICT interfaces and components to enable EVSE operators to offer grid-support services, such as ancillary services and peak shaving to the DSO either and that either bilaterally, or via the Marketplace thanks to charge control of the reverse power from EVs within a load area.
Release 3 (beyond Green eMotion) envisages the trading of EVs aggregated loads enabled through bilateral or via Marketplace connections of traditional energy stakeholders (Retailers, Distribution network operators) and e-mobility-specific stakeholders (EVSE operators and EVSPs).

5.2 Execution of congestion and load management by the EVSE Operator

Energy management of EV connected to the grid is performed in several steps.

First of all the boundaries of the energy domain use cases are to be delimited in the communication between the DSO and the EVSE operator.

Requests of load management coming from the DSO can be triggered from different events depending on the nature of the request: is it for safety/energy reliability reasons or is for economical reasons, meaning that the DSO rewards EVSE operators to respond to DSO's needs to improve the quality of electricity distribution? In the first case (safety and reliability reasons) we refer to congestion management, while when having the economical reasons, we refer to load management.

As a precondition, DSO and EVSE operator will share information on the boundaries of load areas. Once the EVSE operator has identified which load areas he belongs to, he is ready to provide congestion and load management services, which can be triggered by the DSO whenever he

forecasts, within a maximum forecast depth of 48 hours from the current time, the values of target power to be achieved from the EVSE operator. The EVSE operator then performs charging optimization for the EVSEs under its control. The process ends with the EVSE operator tracking the intelligent charging optimization and acknowledging the DSO about the performance of the energy management of EVs connected in its EVSE pool.(see UC flexible load for congestion management and UC Reduce Charge Power by DSO)

Within WP3 other UCs were considered for their relevance in a scenario that envisages a market for aggregated loads from EVs to be provided to the DSO or energy vendors as ancillary services or balancing capacity (see UC Reserve and activate ancillary services and UC provide balancing capacity). However, this use cases may not be of relevance before five years, when it is expected electro-mobility will be able to take part in an aggregation market.
Coming to the object of this paragraph, following are the relevant use cases described within WP3 and cited in this document so far:

Network congestion management / UC flexible load for congestion management

This use case is fundamental to the DSO to avoid hazardous conditions on the grid where energy cannot be supplied to Energy Vendors' clients.
Therefore, whenever congestions are either forecasted or real time detected by the DSO, it sends a request to EVSE operators to lower their load curves in order avoid congestions.

Allow interrupting (economic / emergency reasons)/ UC Reduce Charge Power by DSO
In this use case the DSO and EVSE operator 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

Ancillary services/UC Reserve and activate ancillary services
In this use case an EVSP offers aggregated flexible load or power back to the grid as ancillary service to the DSO in order to help the DSO to fulfil the distribution rules established by the regulation framework in which it operates. Ancillary services may be:
• adjusting frequency and voltage in the local grid
• reducing the imbalance on phases on the LV substation
• adjusting reactive power injection

Aggregated balancing capacity /UC provide balancing capacity

In this use case 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 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, it would participate in different energy markets as any other 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.

5.3 Data interaction with the energy management

Prior to load or congestion management there are some useful data inputs EVSE operators can acquire from DSOs such as the target load curve for a certain load area for a season (see UC below DSO predefines peaks). With this information the EVSE operator can make EVSEs deployment planning or recharging plans taking into account constraints coming from the grid and, thus, having less chances to locate EVSEs in critical load areas with the risk to have energy cut offs by the DSO.

Speaking of data to be delivered at request, useful information can also be provided as a service by EVSE operators, such as the historical usage of EVSEs and the current EV battery state of charge at each point in time (see UC History of EVSE use and UC Current EV charge)

As mentioned above, some use cases in the energy domain refer to data provisioning. They are here recalled from D3.3:

V2G signal

Vehicle to grid signal is a crucial use case in this scheme and it is realizing several features. DSO has responsibility to allow V2G to happen and has to release a signal to the EVSP 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. As a precondition, a contract must be established between EVSP and DSO.

DSO Predefines peaks

This use case is object of Release 1 WP3 machine-to-machine demonstration and it is of key importance for proper deployment planning of the recharging infrastructure to be connected to the grid. Here the DSO sets target load curves for EVSE operators within a load area as an upper bound for energy provisioning to electric vehicles not to provoke congestions on the grid. This service is therefore an input to EVSE operators for decisions in regards to whether to deploy additional investments on their recharging equipment or simply modify their recharging plans without experiencing cut offs from the grid for congestions.

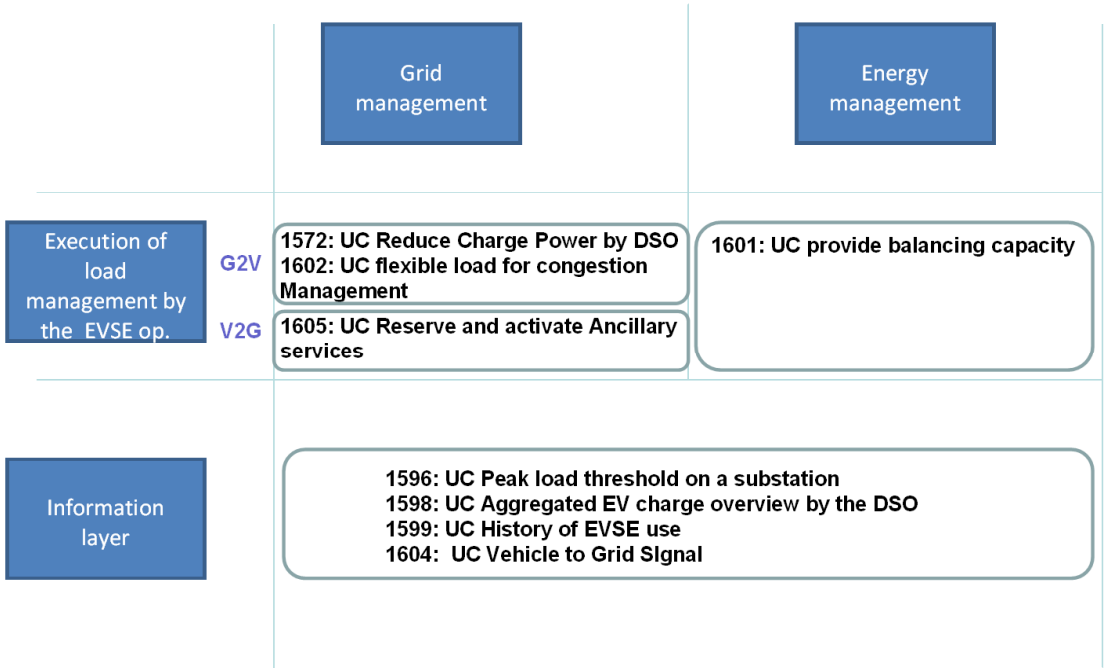
Current EV charge
This use case lies in the second category cited before and consists in the provisioning of the information of the battery State of Charge of an EV connected to a charging point to any stakeholder interested in such information. In example, this service could be used from a TSO or an 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 attitude of the average customer, i.e. sensible information could be that most of the people could unplug their vehicle once it reaches 50% recharge.

History of EVSE use
This use case, as the previous, is within the information delivery category, and is of added value to any actor interested in EVSE usage data analysis through accessing sensible information from EVSE Operator (e.g. historical analysis might beneficial for implementing EVSE booking algorithms, EVSE availability estimation, marketing services, etc.).

5.4 Overview and listing of Energy services - Features and Use Cases

The following section features a simplified graphical scheme showing the structure of all energy use cases we identified and thought worthy of describing in detail. Some use cases of deliverable D3.3 were improved based on the one year experience we made during specification, implementation and test phase. Full structure of use cases together with the features they are realizing by are listed below.



Features and use cases for this domain:

1202: FTR V2G energy supply signal
- 1604: UC Vehicle to grid signal

1313: FTR Allow interrupting
- 1572: UC Reduce Charge Power by DSO

961: FTR DSO predefines peaks
- 1596: UC Peak load threshold on a substation
- 1597: UC Peak shaving

967: FTR History of EVSE use
- 1599: UC History of EVSE use

971: FTR Aggregated balancing capacity
- 1601: UC provide balancing capacity
- 1604: UC Vehicle to grid signal

972: FTR Network congestion management
- 1602: UC flexible load for congestion management

975: FTR Ancillary services
- 1604: UC Vehicle to grid signal
- 1605: UC Reserve and activate ancillary services

5.5 Description of Energy services – Feature level

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 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.

This feature is realized by the following use cases:

1604: UC Vehicle to grid signal

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

This feature is realized by the following use cases:

1572: UC Reduce Charge Power by DSO

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).

This feature is realized by the following use cases:

1596: UC Peak load threshold on a substation
1597: UC Peak shaving

967: FTR History of EVSE use

The historical use of EVSEs is 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.

This feature is realized by the following use cases:

1599: UC History of EVSE use

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

This feature is realized by the following use cases:

1601: UC provide balancing capacity
1604: UC Vehicle to grid signal

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 condition is that the recharging infrastructure is able to fulfil 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 fulfilment of its initial request.

This feature is realized by the following use cases:

1602: UC flexible load for congestion management

975: FTR Ancillary services

An EVSP offers aggregated flexible load as ancillary service to the DSO in order to help the DSO to fulfil 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.).

Reactive power as an ancillary service

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.

Phase balancing ancillary service

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)

This feature is realized by the following use cases:

1604: UC Vehicle to grid signal
1605: UC Reserve and activate ancillary services

Chapter 6: Usability

6.1 Services with relevance for end user interfaces

6.1.1 Overview of Services

Following a prioritization meeting with all WP3 partners, the WP3 team has undergone a usability workshop for selected value added services offered on the GeM Marketplace. Selected Task cases with relevance to end user interfaces are in this chapter described as basis for requirement derivation, user interface design and input of implementation.

Selected Services with relevance for end user interfaces

Reservation task cases

Task case: Short time reservation
Actor: EV driver

Precondition: User will first identify (Login) and then search e.g. for location

Reference to use cases:
- UC: User identification (EVCO-ID)

- UC: Search (enhancement of search - show only EVSEs (with actual status and technical attributes e.g. plug-type), additional options for marketing / promotion of shopping malls, e.g. shop and charge for free, show only EVSEs with charge & ride service (UC: Intermodality Planning, UC: EV Car-Sharing)

User intention	**System responsibility**
	Show reservable EVSEs regarding to location, EVs charge type, radius /distance, maximum duration for show up, reservation fee (all necessary information/attributes. (correlation to UC Advertising And UC Intermodality Planning)
Selects one specific EVSE (ID) of this location or EVSE Pool (ID)	

	Confirms reservation and shows: specific EVSE (e.g. parking lot no. 5) Pool (user can choose any free from the in case of a) and b) Maximum duration for show up, reservation fee

Task case: Mid/long time reservation

Same actor, precondition and task flow as short time reservation.

Additionally user puts in start time, duration and if the reservation is serial (e.g. every Monday) for search.

Task case: Maintain Mid/long time reservation

Actor: EV driver

Precondition: User will first identify (Login)

User intentions	System responsibility
	Shows all reservations
a) changes reservation	
b) terminates reservation	
	a) and b) confirms, in case of a) shows reservation information (same as in task case short reservation)

Task case "charge without contract"

Actor: EV-Driver

Reference to use case: Open Access

Note: If not all EVSEs support the "Charge without contract" functionality the Search Service should include the EVSE information "open access available".

User intentions	System responsibility
Want to access charging without contract for the specific EVSE and roaming is not supported	

	Provides option and instruction on how to access charging without contract. Gives information about payment modalities and conditions for "open access"
Chooses payment option (if there is more than one)	
	Provides secure identification and asks for EV drivers payment information
Provides payment information and identifies Connect EV with EVSE	
	Grants access and starts charging
Stop charging and disconnect EV	
	Informs about costs and load within this charging session Provide invoice

Billing Task Cases

Task case "define billing conditions"
Actor: EVSE-Operator

Reference to use case: B2B Billing

Precondition: User will first identify (Login)

User intention	System responsibility
Confirms reservation and shows: specific EVSE (e.g. parking lot no. 5) Pool (user can choose any free from the in case of a) and b) pa Maximum duration for show up, reservation fee	

	Indicates missing, incomplete or inadequate data

Task case "balance invoice"

Actor: EVSE-Provider

Reference to use case B2B Billing

User intention	System responsibility
	Provides invoice according to defined billing conditions
EVSP (e.g. BMW) balances the invoice	

Task case "Assure payment"

Actor: EVSE-Operator

Reference to use case B2B Billing

User intention	System responsibility
	Overview about pending, overdue or incorrect payments
Demands EVSE-Provider to balance invoice correctly	

6.2 Usability aspects of multi market place integration

Several marketplaces for electro mobility services exist. To provide as many services as possible to the B2B partners it has been decided to link marketplaces. In order to fulfil this new requirement options which include minor changes / enhancements to the Green eMotion marketplace user interfaces for the main use cases are described below.

Specific user requirements & variations
Only minor changes / enhancements to the marketplace user interfaces (no changes in process) for the main use cases.

- *Register*

Option 1: no explicit selection of other marketplaces, automatically registered to partner marketplaces, agreement to all partner marketplace terms & conditions. Individual terms & conditions must be accepted or at least be integrated in terms & conditions of the marketplace

Option 2: explicit selection of other marketplaces, agreement on selected terms & conditions of additional marketplaces

Option 3: (Solution as today implemented) registration only on one marketplace, all services from partner marketplaces will be shown to all users of the marketplace, agreement on terms & and conditions of marketplace and of the service provider if a specific service is requested.

- *Request a service*

Option 1: Show all fees separately (high transparency.)

Option 2: Provide a combined service fee (marketplace fee 1 for transaction + marketplace fee 2 for transaction + fee of service = combined service fee which will be shown (high flexibility for marketplace operator). The marketplace which will provide the service at the end will sum up all transaction fees and shows one fee to the service requester.
In case of option 3 from register: if service requester wants to request a service from another marketplace, he has to agree on its terms & conditions.

- *Provide a service*

In case of option 3 from register: if service provider contributes a new service on the marketplace he has the option to contribute the service explicitly on other marketplaces. The user has to agree to terms & conditions of the additional marketplace(s).

Appendix: Use Case Specification

Core Marketplace Use cases

1239: UC Search and Select Services

Scope & Level	Core Service (BS-S1, BS-S2, BS-S3, BS-S4, BS-S5)		
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	ACT Business Partner		
Secondary actors	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

1241: UC Call of Service

Scope & Level	Core Service (BS-S1, BS-S5)		
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	ACT Service Requester		
Secondary actors	ACT Service Provider		
Main scenario	• The 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 fulfils 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 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

1242: UC Search and Select Service Transactions

Scope & Level	Core Service (BS-S2)		
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 Transactions that meet 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 Partner link • 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	ACT Business Partner		

Secondary actors	ACT Marketplace Business Operator
Main scenario	• The Business Partner fills the search criteria • The marketplace returns a list of Transaction slink that meets the search criteria. • The search result can be exported.
Alternatives	-
Variations	The Marketplace Business Operator is able to receive a list of all Service Transactions.
Related information	The following extension might me considered for a future production grade system: "The Business Partner optionally loads search criteria saved before The Business Partner stores optionally the entered search criteria for later use."
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

1245: UC Search and Select Service Contracts

Scope & Level	Core Service (BS-S1, BS-S2, BS-S3, BS-S4)
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 Contracts that meet his search criteria and is able to select **one or more** Service Contracts from the list for further activities. E.g. search criteria may include: • Valid and terminated Service Contracts • Active and suspended Contracts link • Contracts which are expired or close to expiration (for prolongation)

Failure outcome	Failure	Outcome	Condition leading to outcome
	No Service Contracts are found	Display of an error message	There are no service contracts that meet the search criteria
Primary actor	ACT Business Partner		
Secondary actors	ACT Marketplace Business Operator		
Main scenario	• The Business Partner fills the search criteria • The marketplace returns a list of Service Contracts that meet the search criteria.		
Alternatives	-		
Variations	The Marketplace Business Operator is able to receive a list of all Service Contracts.		
Related information	The following extension might me considered for a future production grade system: "The Business Partner optionally loads search criteria saved before The Business Partner stores optionally the entered search criteria for later use." The "suspended" state will be only available after UC 1490 has been implemented		
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		

1246: UC Create Service Contract Change Request

Scope & Level	Core Service (BS-S3)
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	ACT Business Partner (ACT Service Provider or 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		

1247: UC Confirm Service Contract Change

Scope & Level	Core Service (BS-S3)

<table>
<tr><td>Goal in context</td><td colspan="3">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.</td></tr>
<tr><td>Preconditions</td><td colspan="3">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</td></tr>
<tr><td>Successful outcome</td><td colspan="3">The change request (terms & conditions, pricing, ...) on a Service Contract is accepted or rejected by the other Business Partner.</td></tr>
<tr><td>Failure outcome</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">ACT Business Partner (ACT Service Provider or ACT Service Requester)</td></tr>
<tr><td>Secondary actors</td><td colspan="3">-</td></tr>
<tr><td>Main scenario</td><td colspan="3">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.</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: 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</td></tr>
</table>

1250: UC Register Service

Scope & Level	Core Service (BS-S1, BS-S3, BS-S4)		
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 outcome	The Service is registered.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
			.
Primary actor	ACT Service Provider		
Secondary actors	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 • 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		

1255: UC Start/Stop Service

Scope & Level	Core Service (BS-S4)

Goal in context	A Service can be temporarily disabled.		
Preconditions	• A Service is selected. • The Service is available and published.		
Successful outcome	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 "Published"
	Start Error	Display of an error message	Service is not stopped.
	Stop Error	Display of an error message	Service is not started
Primary actor	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		

1256: UC Delete Service

Scope & Level	Core Service (BS-S4)

Goal in context	A Service is removed from the marketplace, e.g. a new version of the Service is available.		
Preconditions	• A Service is selected. • The Service is disabled permanently.		
Successful outcome	The Service is removed after the following actions:		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Status Error	• Notification of the Service Provider • Cancellation of the deletion process	The Service is not disabled permanently.
Primary actor	ACT Service Provider		
Secondary actors	ACT Marketplace Technical Operator		
Main scenario	• The Service Provider requests the deletion of the Service • The Marketplace Technical Operator removes the Service from the Service Catalogue. • The Service Provider is notified.		
Alternatives	-		
Variations	-		
Related information	-		

Issues	Not all information of the Service can be deleted. Its Service Transactions have to be available after the deletion. **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

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1257: UC Propose new Standard Interface

Scope & Level	Core Service (BS-S1,BS-S5)		
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	ACT Business Partner		
Secondary actors	ACT Business Partner, 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

1373: UC Search and Select Business Partner

Scope & Level	Core Service (BS-S6)		
Goal in context	Find Business Partners		
Preconditions	The searching actor is the Marketplace Business Operator		
Successful outcome	The Marketplace Business Operator receives an ordered list of the Business Partners and is able to select one or more Business Partners from the list for further activities.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Business Partners are found	Display of an error message	There are no business partners
Primary actor	ACT Marketplace Business Operator		
Secondary actors	-		

Main scenario	• The marketplace returns a list of Business Partners
Alternatives	-
Variations	-
Related information	The following extension might me considered for a future production grade system: "The Business Partner fills the search criteria or load search criteria saved before The Business Partner stores optionally the entered search criteria for later use." where the search criteria could be related to the state of the business partner account, any attribute of the business partner profile or even the offerings and contracts in place.
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

1374: UC Create Business Partner Account

Scope & Level	Core Service (BS-S6)		
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	ACT Business Partner		
Secondary actor	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 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		

1376: UC Change Business Partner Account

Scope & Level	Core Service (BS-S6)
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 request	Request Form is not filled correctly
Primary actor	ACT Business Partner		
Secondary actor	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		

1377: UC View Business Partner Account Details

Scope & Level	Core Service (BS-S6)

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	ACT Business Partner		
Secondary actors	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		

1378: UC Change Business Partner Account Details

Scope & Level	Core Service (BS-S6)

<table>
<tr><td>Goal in context</td><td colspan="3">Detail Data of a Business Partner are changed.</td></tr>
<tr><td>Preconditions</td><td colspan="3">Business Partner is registered at the marketplace</td></tr>
<tr><td>Successful outcome</td><td colspan="3">The detail data of a Business Partner are changed in the system at his request.</td></tr>
<tr><td>Failure outcomes</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td>Request not complete</td><td>• Display of an error message
• Cancellation of the change request</td><td>Request Form is not filled correctly</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">ACT Business Partner</td></tr>
<tr><td>Secondary actor</td><td colspan="3">ACT Marketplace Business Operator</td></tr>
<tr><td>Main scenario</td><td colspan="3">• 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</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: 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</td></tr>
</table>

1379: UC Activate Business Partner Account

Scope & Level	Core Service (BS-S6)		
Goal in context	The account of a Business Partner is activated.		
Preconditions	Business Partner is **registered and deactivated** at the marketplace		
Successful outcome	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	ACT Business Partner		
Secondary actor	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		

1380: UC Deactivate Business Partner Account

Scope & Level	Core Service (BS-S6)		
Goal in context	The account of a Business Partner is deactivated at the marketplace		
Preconditions	Business Partner is **registered and activated** at the marketplace		
Successful outcome	The Business Partner is deactivated 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
	Inactivation not accomplished	• Notification • Cancellation of the deactivation request	Business Partner has active service contracts at the marketplace
Primary actor	ACT Business Partner		
Secondary actor	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

1470: UC Create Service Contract Offering

Scope & Level	Core Service (BS-S1, BS-S3, BS-S4)		
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 outcome	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	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	Realization of FTR 2293 allows including more than one service in a Service Contract Offering. Realization of FTR 2292 allows including interfaces in a Service Contract Offering which have to be implemented and exposed by the contracting party while the creator of the offering later on consumes it.
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

1471: UC View Service Transaction Details

Scope & Level	Core Service (BS-S2)		
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 own Service Transaction is chosen		
Successful outcome	The Business Partner views the details of an **own** Service Transaction.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	ACT Business Partner		
Secondary actors	ACT Marketplace Business Operator		
Main scenario	• The Business Partner chooses the details view of an **own** Service Transaction. • 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

1475: UC Search and Select Standard Interface

Scope & Level	Core Service (BS-S1, BS-S4, BS-S5)		
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 Interfaces link • 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	ACT Business Partner		
Secondary actors	ACT Marketplace Technical Operator		

Main scenario	• The Business Partner fills the search criteria • The marketplace returns a list of Standard Interfaces that meet the search criteria.
Alternatives	-
Variations	-
Related information	The following extension might me considered for a future production grade system: "The Business Partner optionally loads search criteria saved before The Business Partner stores optionally the entered search criteria for later use"
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

1476: UC View Standard Interface Details

Scope & Level	Core Service (BS-S1, BS-S5)		
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	ACT Business Partner		
Secondary actors	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

1477: UC Create Service Registration Contract

Scope & Level	Core Service (BS-S3, BS-S4)		
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	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

1478: UC Download Service Content

Scope & Level	Core Service (BS-S1)		
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	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

1479: UC View Service Contract Details

Scope & Level	Core Service (BS-S3)		
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	ACT Business Partner		
Secondary actors	ACT Marketplace Business Operator		
Main scenario	• The Business Partner chooses the details view of an **own** Service Contract • 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

1480: UC Create Service Contract Termination Request

Scope & Level	Core Service (BS-S3)		
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	ACT Business Partner (ACT Service Provider or 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

1481: UC Confirm Service Contract Termination

Scope & Level	Core Service (BS-S3)		
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	ACT Business Partner (ACT Service Provider or 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

1482: UC View Service Contract Template

Scope & Level	Core Service (BS-S3)		
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 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	ACT Business Partner		
Secondary actor	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

1484: UC View Service Details

Scope & Level	Core Service (BS-S1, BS-S3, BS-S4)		
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.) • Offering link		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	ACT Business Partner		

Secondary actors	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

1485: UC Create Service Contract

Scope & Level	Core Service (BS-S1, BS-S3)		
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	ACT Service Requester		
Secondary actor	-		

Main scenario	• The Service Requester chooses a Service and reviews the Service Contract Offering with its options. • The Service 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 as soon as the contract becomes active.
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

1486: UC Enable/Disable Service permanently

Scope & Level	Core Service (BS-S4)
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	ACT Service Provider		
Secondary actors	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		

1487: UC Download Service Specification

Scope & Level	Core Service (BS-S1)
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	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		

1488: UC Upload Service Content

Scope & Level	Core Service (BS-S1, BS-S4)		
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 outcome	Additional content is uploaded to the marketplace.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**

Primary actor	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 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		

1489: UC Upload Service Specification

Scope & Level	Core Service (BS-S1,BS-S4)		
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 link 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	ACT Service Provider		

Secondary actor	-
Main scenario	• The Service Provider uploads the Service Interface (e.g. WSDL) and the link 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

1490: UC Suspend/Resume Service Contract by Service Requester

Scope & Level	Core Service (BS-S1, BS-S3, BS-S5)		
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	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

1491: UC Create Service Transaction

Scope & Level	Core Service (BS-S1, BS-S2)		
Goal in context	After a service call of a Service by the Service Requester a Service Transaction Entry is created		
Preconditions	A 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	ACT Service Requester
Secondary actor	-
Main scenario	After a service call a Service Transaction Entry is created and stored by the marketplace, the entry reflects if the call has been valid or not.
Alternatives	-
Variations	-
Related information	-
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

1492: UC Aggregate Service Call Results

Scope & Level	Core Service (BS-S1, BS-S5)		
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 Requester.		
Preconditions	• 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		
Successful outcome	The Service Requester receives on single result of a service call that is routed to different Service Providers.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Invalid Request	• Creation of an error response message	The service request is not compatible with the Service Interface.

	Single Response Error	• Creation of an information message included in the result • Aggregation of the remaining results	Technical Issues
Primary actor	ACT Service Requester		
Secondary actors	ACT Service Provider		
Main scenario	• The 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 fulfils 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		
Alternatives	-		
Variations	-		
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		

1493: UC Publish Standard Interface

Scope & Level	Core Service (BS-S5)
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	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		

1494: UC Publish Service

Scope & Level	Core Service (BS-S4)		
Goal in context	A Service is published at the marketplace.		
Preconditions	A Service is registered and selected.		
Successful outcome	• Publish a new Service		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**

Primary actor	ACT Service Provider		
Secondary actors	ACT Marketplace Technical Operator		
Main scenario	• The Service Provider requests the publishing of the Service • The Marketplace Technical Operator enables the Service in the Service Catalogue. • The Service Provider is notified.		
Alternatives	-		
Variations	-		
Related information	The following extension might me considered for a future production grade system: "If, in the context of service versions, a change to an already published service should be implemented, this UC or a variation of it need to cover this including all consequences like contract changes accordingly" For the time being, a new version of a service can be treated like any other new service.		
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		

1618: UC Marketplace - Login

Scope & Level	Core Service (BS-S1, BS-S2, BS-S3, BS-S4, BS-S5, BS-S6)		
Goal in context	A Business Partner authenticates himself against the marketplace.		
Preconditions	Business Partner is registered before.		
Successful outcome	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	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 information	-		
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		

1619: UC Marketplace - Logout

Scope & Level	Core Service (BS-S1, BS-S2, BS-S3, BS-S4, BS-S5, BS-S6)		
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 outcome	The user session of the Business Partner is terminated.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	ACT Business Partner		
Secondary actor	-		

Main scenario	• The Business Partner performs a logout. • The session for the Business Partner is terminated.
Alternatives	-
Variations	-
Related information	-
Issues	**Availability:** 24/7 availability required **Performance:** sub-second response time for Marketplace Transactions **Scalability**: capable to grow with electro mobility market

1620: UC Search and Select Requests for new Services

Scope & Level	Core Service (BS-S1)		
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	ACT Business Partner		
Secondary actors	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

1623: UC View Details of Requests of new Services

Scope & Level	Core Service (BS-S1)		
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: • Requirements • Pre-/Post conditions • ...		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	ACT Business Partner		
Secondary actors	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 market

1624: UC Change Service Contract Offering

Scope & Level	Core Service (BS-S1, BS-S3)		
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	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

1625: UC Create Request for a new Service

Scope & Level	Core Service (BS-S1)		
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	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

1626: UC Change Request for a new Service

Scope & Level	Core Service (BS-S1)		
Goal in context	The Service Requester changes his **own** Request for a new Service.		
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	ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester changes the attributes in a prefilled form with the requirements of his **own** Request for a new Service. • 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

1627: UC Delete Request for a new Service

Scope & Level	Core Service (BS-S1)		
Goal in context	The Service Requester deletes his **own** Request for a new Service.		
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	ACT Service Requester		
Secondary actor	-		
Main scenario	• The Service Requester requests the deletion of his **own** Request for a new Service. • 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

1629: UC Create Response on Requests for new Services

Scope & Level	Core Service (BS-S1)		
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 fulfils the 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	ACT Service Provider		
Secondary actors	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

1687: UC Notify Service Requesters of own Service

Scope & Level	Core Service (BS-S4)		
Goal in context	The Service Provider or the Marketplace Operator sends notifications to all Service Requesters of his **own** Service.		
Preconditions	• A Service Offering is selected.		
Successful outcome	All Service Requesters of a Service Offering are notified.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	ACT Service Provider		
Secondary actors	ACT Marketplace Operator		
Main scenario	• The Service Provider or the Marketplace Operator fills a form to create a notification to the Service Requesters of his **own** preselected Service Offering. • All Service Requesters of the Service Offering with active contracts are notified.		
Alternatives	-		
Variations	-		
Related information	This use case represents a simple notification. There will be no information for the Service Provider, if the Service Requesters have 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

2333: UC Monitor Services

Scope & Level	Core Service (BS-S2)		
Goal in context	Obtain an overview of service KPIs.		
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 a number of service KPIs based on transactions where he is involved as one party and is able to export the list. (The Marketplace Business Operator instead receives the same information for all parties)		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Service Transactions are found	Display of an error message	There are no service transactions matching the search criteria and therefore no KPIs can be calculated.
Primary actor	ACT Business Partner		
Secondary actors	ACT Marketplace Business Operator		
Main scenario	• The Business Partner fills the search criteria (timeframe) • The Business Partner defines the aggregation levels (as being defined in FTR 2294) • The marketplace returns a list of the aggregated KPIs being defined in FTR 2294 in respect to the search criteria. • The list can be exported as CSV.		

Alternatives	The list is not being displayed, the CSV is being provided for export only. Analysis and visualization can be done in external programs like spreadsheet applications in this case.
Variations	On top of providing a list with aggregated results, the user can define which dimensions, levels and KPIs are being shown in rows, columns and sections of a three-dimensional data cube. The user can slice, dice and drill up and down dynamically. In addition a graphical representation of the data (different kinds of diagrams) might be provided.
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

General e-mobility use cases

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	5. Communication between SECC and EVCC shall be established successfully 6. The customer can identify himself 7. Online connection between SECC and EVSE operator is required. 8. 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 contract identification (EVCO-ID). This could also be done automatically. link SECC and link EVCC exchange their IDs (e.g. EVCO-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 contract identification (EVCO-ID).
Alternatives	-
Variations	EVSE Operator and EVCC may exchange contract information (EVCO-ID) directly e.g. via ISO 15118
Related information	A user can have multiple EVCO-ID's.
Issues	Security and privacy

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. EVCOID, 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		

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 Authorizations 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 switching, such as control of charge, priority charge, cost optimized charge, communication (progress report), etc.
Preconditions	• EVSE operator can identify the EVCOID 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.)

Successful outcome	• 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.)		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Access not granted	No service is provided	• Incompatibility in hardware or communication
	Charging is interrupted	Service delivery interrupted	• EVSE operator not responding • DSO, EVSE operator or user intervenes • Damaged connection, hardware or software
Primary actor	1406: ACT EVSE Backend 1407: ACT EVSP backend 133: ACT Vehicle Driver		
Secondary actor	129: ACT DSO Distribution system operator 132: ACT EVSE Operator 128: ACT EVSP (Electric Vehicle Service Provider) 140: ACT Clearinghouse		

Main scenario	• 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
Alternatives	Mode 1 or 2 charging (By default we assume there is only Mode 3 charging).
Variations	The Clearinghouse is involved only in case of roaming.
Related information	-
Issues	-

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 link 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 outcome	The user is enabled to enabled to access and consume consumption monitoring services		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	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 inaccurate 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 information	In certain cases CDR is sent from EVSE Operator to EVSP via the Clearinghouse.		
Issues	-		

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 Fleet manager		
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	-		

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 Fleet manager		
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	-		

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 Fleet manager		
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	-		

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 Fleet manager		
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	-		

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 Fleet manager		
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	-		

1525: UC User wants 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 fulfil 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		

1527: UC Search for EVSE

Scope & Level	Value added service (realizing FTR 1808 Find appropriate search point

<table>
<tr><td>Goal in context</td><td colspan="3">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.
EVSE search includes search functionality based on search criteria (e.g. Address, status, plug type), show result of search on a map (visualized and provided by the frontend of the EVSP) and possibility to integrate advertising located to EVSE.</td></tr>
<tr><td>Preconditions</td><td colspan="3">• 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 an EVSEID
• Advertising have to be linked to EVSE</td></tr>
<tr><td>Successful outcome</td><td colspan="3">-> Find a suitable EVSE
-> Advertising related to EVSE search an EV-enduser preferences</td></tr>
<tr><td>Failure outcomes</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td>EVSE location cannot be found</td><td>No charging point available</td><td>• No communication to charging point
• Inconsistent data-scheme</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">133: ACT Vehicle Driver</td></tr>
<tr><td>Secondary actors</td><td colspan="3">131: ACT EVSE (Electric Vehicle Supply Equipment)
128: ACT EVSP (Electric Vehicle Service Provider)</td></tr>
<tr><td>Main scenario</td><td colspan="3">• Entering search criteria for charging points (e.g. type of station, type of plug, charge power, exact location, prices, services, energy source)
• Search criteria that the system will filter based on are displayed for confirmation
• EV driver confirms the search
• Display result, that mean information about selected charging points</td></tr>
<tr><td>Alternatives</td><td colspan="3">-</td></tr>
<tr><td>Variations</td><td colspan="3">The search functionality will vary from service provider to service provider. The combination of search functionalities is endless and cannot fully be described</td></tr>
</table>

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) Following interface will be supported: - EVSE-master data upload from EVSE-operator - EVSE-status data upload from EVSE-operator - EVSE search request from EVSP
Issues	

1528: UC Reservation of EVSE

Scope & Level	The Reservation of EVSE is a value added service The Reservation can be triggered by based on the "Search of CP UC (1527) FTR (978).
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. Reservation can be from the time perspective divided into two categories: - short term (acute) - mid – long term.
Preconditions	• EVSE has a communication to a backend system allowing reservation (e.g. Charging Management System or Infrastructure management system (IMS)) • EVSE has a unique ID (grid ID) -> EVSE-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 • EVSP backend will indentify and authorize the EV driver and send the relevant EVCO-ID to the service reservation of EVSE
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	3. Perform a search as being described in UC 1527 / FTR 978 4. Reservation of EVSE (EVSE-POOL) by the EV driver: a. immediate b. for a time frame in the future 5. Confirmation of reservation by EVSP backend system 6. Use of reservation, charging of EV To confirm the reservation of the EVSE, the EV driver receives a confirmation message per email, sms or similar from the relevant EVSP.		
Alternatives			
Variations			
Related information	Payment process - Integration of EVSP backend-system will not be demonstrated in Rel. II For the reservation of an EVSE the EV driver has to search for the EVSE. This use case enhances (is embedded in) the UC 1527 before charging. • Reservation of EVSE requires a high and fast system performance (complex algorithm and response time < 3 seconds)		
Issues	System performance		

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. EVSEID, 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%) • Requires a high systems performance / and fast response time • Requires a secure and stable system environment		
Issues			

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 Fleet manager		
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	-		

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	3. The EVSE Op. backend is connected to the market place 4. The EV driver needs to have a (roaming) contract with a EVSP 5. The EVSE Op. needs to have a contract with the EVSP 6. The EVSE Op. is able to detect, if the CP is blocked by any car 7. 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) 8. The parking lot must be owned by the EVSE Operator		
Successful outcome	The HMI signalizes, that the EVU 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.

1558: UC Update Charging Details

Scope & Level	Value added service. Transmission of charging information. This use case realizes FTR 1309 charging management
Goal in context	The detailed charging information is transferred to the market place database.
Preconditions	The EV is connected to the supply equipmentand 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	-

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 EVfor 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 EVfor every energy retailerthat 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 behaviour]. 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	-		

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.	4. Display of an error message 5. 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?

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	-		

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 re-establishes	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

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 are transmitted 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	-		

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 Fleet manager 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)		

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 M2Vin 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	-

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) • Favourite 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			

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 re-established	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	-

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 Fleet manager 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 a. predefined notifications (for the driver) if the vehicle enters or leaves a specified area b. 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	-

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.

2248: UC Search for intermodal transport

Scope & Level	Value added service		
Goal in context	Application that enables EV Driver to search for EVSE including the connection to intermodal transportation and further routing to final destination.		
Preconditions	End user of the Intermodality application has to have a valid contract with an EVSP that provides intermodality planning or the EVSP is subscribed for such service offered by Intermodality service provider on the Marketplace. EVSP providing Intermodality planning has service contract with the Search for EVSE service. Public transport information has to be up-to-date and available to the Intermodality service provider. Historical data can also be a valuable source of information in order to detect correlations between exogenous factors (e.g. the weather or time of the day) and the influence on intermodal transportation (i.e. delays, availability of EVSE).		
Successful outcome	The End user of the Intermodality application is able to search for EVSE and adjacent connections in public transport to reach final destination		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No Public transport data	Only EVSE / parking is displayed as result of search	Public transport data is not available
Primary actor	EV driver		
Secondary actors	EVSP, Service provider of Search for EVSE service, Service provider for Intermodal planning		

Main scenario	• Final destination is entered into Intermodality application • Driver profile and preferences for the types of travel are considered (e.g. refusing certain mode of transport) • EV driver is prompted to enter desired time of arrival at final destination • Current location of traveller is considered • EV battery parameters are considered (if available): a. Battery current state of charge b. Battery discharge profile (what is the range of the vehicle from current status) c. Battery charging profile (how long does it take to charge the battery) • Search for Parking / EVSE close to destination and along the route to the destination is initiated based on: a. Location b. authentication and payment method c. type and mode of charging d. availability to park / charge e. rate of charging f. rate of car park • Search for nearby public transport connections is initiated based on: a. Proximity of Parking / EVSE to final destination b. Proximity of Public transport / other means of transport to the parking / EVSE c. Time of connections to final destination d. Cost of transport to final destination • Park and charge and ride alternatives are displayed to EV driver including their: a. Total time to destination and estimated arrival time b. Total cost of transport to final destination c. Remaining check points where the driver has to still make purchases (bus tickets, metro, etc.) d. CO2 footprint (optional) • Offers for additional services near the EVSE / parking and near final destination are displayed to the driver
Alternatives	EV Driver is using public transport and would like to use the Intermodality application to search for EV / NEV sharing options near his destination (e.g. city center)

Variations	-
Related information	-
Issues	-

2249: UC Remote Authentication / Push Authorization

Scope & Level	Clearing Service: EV driver activates charging using an authentication means (e.g. Smartphone App or Hotline) of his home provider.		
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.		
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 133: ACT Vehicle Driver		
Secondary actors	136: ACT Marketplace Operator 140: ACT Clearinghouse		

Main scenario	- Driver starts smartphone app - Driver provides the EVSE ID and his contract identification (EVCOID and additional security information e.g. password) - Provider is validating contract id and EVSE ID - In case of successful validation the provider backend sends activation request to clearinghouse/marketplace - Marketplace will forward the activation request to the EVSE operator - EVSE operator will activate the charging spot.
Alternatives	
Variations	The EVSEID and with that the B2B contract can be checked by the clearing house
Related information	
Issues	-

2252: UC Select and reserve intermodal transport

Scope & Level	Value added service		
Goal in context	EV driver is able to reserve a charge pole and connecting transportation through the Intermodality application		
Preconditions	End user of the Intermodality application is able to search for intermodal transport UC 2248 Results of the UC 2248 Search for intermodal transport are available for reservation		
Successful outcome	The End user of the Intermodality application is able to select and reserve EVSE and adjacent connections in public transport resulting from the Search for intermodal transport use case		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Search for intermodal planning is not functioning	EV driver is not able to reserve EVSE and transportation to the final destination	Search for intermodal planning does not return possible reservations
Primary actor	EV driver		

Secondary actors	EVSP, Service provider of Search for EVSE service, Service provider of In
Main scenario	• EV driver is displayed search results from the Search for Intermodal planning use case • EV driver selects the desired intermodal transport route • Reservation request is submitted to the: a. EVSE Operator of the selected parking / charging (incl. Estimated Time of Arrival at EVSE) b. Other reservable means of transport (taxi, bike, train, car sharing hotspot, etc.) • EV driver receives confirmation of the reservation including the: a. Time of connections to final destination and estimated time of arrival b. Total cost of transport to final destination c. Reservation period at EVSE (time while EVSE is exclusively reserved) d. Remaining check points where the driver has to still make purchases (bus tickets, metro, etc.) e. CO2 footprint of the travel (optional) f. Other (e.g. remaining pre-paid credit on EV drivers account, etc.) • EV driver is presented the offers he can apply for to receive discounts (coupons, discounts, etc.)
Alternatives	In an enhanced version of this use case, the EV driver could also pay for the connecting modes of transport. This would require integration of the EVSP account with the municipal / transport payment systems.
Variations	-
Related information	-
Issues	-

2253: UC Navigate to destination of Intermodal transport

Scope & Level	Value added service

<table>
<tr><td>Goal in context</td><td colspan="3">EV driver is offered navigation assistance to EVSE and connecting transportation through the Intermodality application</td></tr>
<tr><td>Preconditions</td><td colspan="3">End user of the Intermodality application is able to search for intermodal transport UC 2248
User selects one of the alternatives offered by the UC 2248 Search for intermodal transport</td></tr>
<tr><td>Successful outcome</td><td colspan="3">EV driver is offered navigation assistance to the parking / EVSE and the final destination</td></tr>
<tr><td>Failure outcome</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td>Navigation assistance is not functioning</td><td>EV driver is not offered navigation assistance</td><td>GPS coordinates of the EVSE / parking or the final destination are not available</td></tr>
<tr><td></td><td>Navigation advice does not appear on the device</td><td>EV driver cannot access the navigation assistance</td><td>EV driver's device does not support navigation</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">EV driver</td></tr>
<tr><td>Secondary actors</td><td colspan="3">EVSP, Service provider of Search for EVSE service, Service provider of In</td></tr>
<tr><td>Main scenario</td><td colspan="3">• EV driver receives link to navigation advice after confirming the final destination and intermodality connection
• Driver accesses the link to view the route with details (e.g. Google maps)
• At the time of departure EV driver can access the link from the EV, including his current position
• The application will navigate driver to the parking / EVSE
• After parking the Intermodal planning application will navigate EV driver to the next connection point</td></tr>
</table>

Alternatives	• The coordinates and the Google maps link to the parking / EVSE and final destination are displayed to the EV driver after the selection of the search results. EV driver enters it manually to a GPS navigation system. In this alternative the Intermodality application does not have a navigation interface. • Only the coordinates are displayed, no link to Google maps • The driver starts his journey using another mean of transport and has to be navigated through to the transport connections to his EV
Variations	In an enhanced version of the Use Case the driver can also locate the position of his EV after he has parked the car and continued his journey with other transportation means (by using a smartphone app or portal).
Related information	-
Issues	-

2255: UC Open access

Scope & Level	Value added service		
Goal in context	Provide charging for a customer regardless of EVSP or roaming contracts normally granting access to a specific EVSE. Authorization, access and payment are processed on the spot – this use case is referred to as “open access”		
Preconditions	Compatibility between car plug, charge cable and EVSE. Payment terminal to authorize customer and process transaction. A communication channel between EV driver and EVSE operator (SMS, mobile app, phone call, voice response etc.) Ability to grant remote access to charge spot and initiate charge session from EVSE operator backend		
Successful outcome	Charging is granted successfully		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**

	Authorization or transaction cannot be processed	charging is not authorized	connectivity issues
Primary actor	EVSE Operator Backend, EV driver, Third party - payment terminal operator, EVSE frontend		
Secondary actors	EVSP		
Main scenario	An EV driver wants to charge his vehicle and searches for publically available charge spots based on certain criteria. In this case, the driver would be interested in identifying "open accessible" charge spots, which can be accessed independently of EVSP relationships or roaming contracts. The service can be accessed and paid for without a contract: 1. The driver searches for "open access" charge spots 2. The driver arrives at the charge spot and follows instructions on how to access service, could be given either directly on charge spot or via device 3. The driver shares via channel (mobile app, sms, phone call, voice response, etc) the needed information with EVSE operator, as a minimum EVSEID and credit card details 4. The EVSE operator authorizes the customer via payment terminal 5. The EVSE operator grants access remotely and informs the driver to plug in 6. The EVSE operator checks if session is initiated 7. The EVSE operator finalizes transaction 8. The EVSE operator sends receipt to the driver		
Alternatives	-		
Variations	Emergency Charging: refers to the situation where an EV driver is in an emergency situation and is run out of power. The customer can order an emergency EV charging service via a specified channel, e.g. phone call to hotline, sms, on-board device, mobile app etc. The service could be paid for either as part of an EVSP contract or as "open access" paid per use via credit card transaction.		
Related information	-		
Issues	-		

2257: UC Driver portal transactions and energy information

Scope & Level	Value added service (realizing 2258 FTR Driver portal)

Goal in context	Web or mobile application to enable EV Driver visualize the transaction history of his EVSP account and RFID cards and respective balances		
Preconditions	EV driver is enabled to access and use the Driver portal EVSE transaction data is available on the backend system of the EVSP and the Driver portal is connected to the EVSP backend system		
Successful outcome	End user is able to view transaction history of his account from through the Driver portal		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Transaction data are not available	EV driver will not get the requested data visualized on the Driver portal	Transaction data have been stored in a location which is disconnected from the Driver portal
Primary actor	EV driver, Driver portal		
Secondary actors	EVSP		
Main scenario	EV driver selects Transaction history from the Driver portal menu Calendar windows with start and end time of transaction search are displayed Dropdown row with the type of transaction is displayed, this includes: • per user view (in case there are multiple RFID cards per account) • aggregated view for the whole account • transactions on roaming / all transactions • card balances (prepaid) • overview (history) of monthly invoices • extra services used • total consumption • CO2 total footprint • rewards for participating in DR schemes • other EV Driver selects the time interval and type of transaction and confirms Transactions are displayed		
Alternatives	-		
Variations	-		
Related information	This use case is applicable to both web and mobile versions of the portal		

Issues	-

2260: UC Driver portal homepage & general information

Scope & Level	Value added service (realizing 2258 FTR Driver portal)		
Goal in context	Homepage of web or mobile application to visualize multiple aspects of the EV driver account with EVSP. EVSP can place announcements, commercial (e.g. EVSE accessories) offers, press releases, tutorials, FAQ, and other information beneficial to EV driver.		
Preconditions	EVSP or 3rd party in the role of the Driver portal operator uploads content to this part of the portal, or enables third parties to upload content / offers to this part of the portal EV Driver has access to the Driver portal		
Successful outcome	End user is able to log in and view the homepage of the Driver portal with general information as well as navigate to other sections of the portal such as account management, transaction history, etc.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	EV driver, Driver portal		
Secondary actors	EVSP (or 3rd party in the role of Driver portal operator)		

Main scenario	EVSP (portal operator) uploads and updates content to the homepage of the portal Content may include information such as: • FAQ, tutorials to use different types of EVSE • Press releases, announcements of outages, other information • commercial offers of EVSE HW providers, accessories • connection to social media and benchmarking EV driver can view general information and click on one of the offers or other tabs which will navigate him to other sections of the portal.
Alternatives	-
Variations	-
Related information	This use case is applicable to both web and mobile versions of the portal
Issues	-

2261: UC EVSE network portal homepage view charge poles

Scope & Level	Value added service (realizing 2259 FTR EVSE network portal)		
Goal in context	Homepage of web portal to enable EVSE network operator visualize EVSE connection points on a GIS interface such as Google maps and view selected basic parameters of the EVSE.		
Preconditions	EVSE Op is enabled to access and use the EVSE network portal Operator of the EVSE network portal has contract with and is connected (e.g. via Marketplace) to: • GIS provider to visualize the EVSE, and • service provider that provides EVSE data (in case of visualization of foreign EVSE), and • own database that provides stored EVSE data for visualization		
Successful outcome	EVSE operator is able to visualize EVSE connection points on a map, based on criteria offered in the menu of the portal		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSE data is not available	EVSE information is not displayed on the portal	EVSE data provider or internal database with EVSE data is not functioning

Primary actor	EVSE Operator, EVSE network portal		
Secondary actors	GIS or other provider of EVSE network visualization service, Service provider of external EVSE data, EVSE database with own EVSE data		
Main scenario	EVSE Operator selects view EVSE from the EVSE network portal menu Basic own charge pole utilization view (graphs, histograms, EVSE currently in use, etc.) is displayed based on settings Basic map with EVSE managed by the EVSE operator is displayed (based pre-set pool of EVSE) Underneath a drop down menu or buttons with view options are displayed: • aggregation menu (whole network by geo area, only own network by geo area, public / semi public, private, EVSE particular tenants (e.g. airport)) • grouping of charge poles in a particular location menu (charge pools in a parking lot, e.g. ground levels) Resulting EVSE are highlighted on the map based on the selected view options		
Alternatives	-		
Variations	-		
Related information	-		
Issues	-		

2264: UC EVSE network portal energy flows

Scope & Level	Value added service (realizing 2259 FTR EVSE network portal)
Goal in context	Section of web portal to enable EVSE network operator to visualize EVSE connection points and obtain information about the EVSE viewed at multiple levels and related to energy flows.

Preconditions	EVSE Op is enabled to access and use the EVSE network portal Operator of the EVSE network portal is connected to: • EVSE database • energy providers that provide EVSE consumption and other energy data interfacing directly to the EVSE network portal or to the EVSE network database • database that stores data from the energy providers		
Successful outcome	EVSE operator is able to visualize EVSE connection points on a map, view basic energy statistics of his EVSE network and is able to retrieve and adapt selected energy information of a particular EVSE		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSE energy data is not available	EVSE information is not displayed in the energy section of the portal	Energy provider interface with EVSE database or the EVSE network portal is not functioning
Primary actor	EVSE Operator, EVSE network portal		
Secondary actors	EVSE database, Energy provider		

Main scenario	EVSE Operator selects EVSE Energy tab from the EVSE network portal menu Basic energy statistics of own EVSE network (energy throughput graphs, peaks, EVSE currently in use, etc.) are displayed over pre-set time (stats per day, stats per month): EVSE operator can select a time interval (start day - end day) from a calendar Underneath a drop down menu or buttons with view options are displayed: • aggregation menu (whole network by geo area, only own network by geo area, public / semi public, private, EVSE particular tenants (e.g. airport)) • grouping of charge poles in a particular location menu (charge pools in a parking lot, e.g. ground levels) EVSE are highlighted on a map loaded based on the selected view options Basic statistics from the initial energy screen are adapted to the selected subset of the EVSE EVSE Operator can view particular energy information of the selected one or more EVSE: –Historical kWh by time blocks –Historical peaks (Day, Hour, Year) –Real Time –Forecasted (if applicable) EVSE Operator can click on one or more EVSE and change attributes related to energy such as define load area, define time of use tariff, update rate, define peak thresholds for alarm in a load area, etc. EVSE Operator can participate in EVSE pooling schemes for DR aggregators by enabling selected EVSE to be controlled by 3rd party (e.g. for deferred charging)
Alternatives	-
Variations	-
Related information	-
Issues	-

2265: UC EVSE network portal financial information

Scope & Level	Value added service (realizing 2259 FTR EVSE network portal)		
Goal in context	Section of a web portal to enable EVSE network operator to visualize EVSE connection points and obtain financial information about the EVSE viewed at multiple levels		
Preconditions	EVSE Op is enabled to access and use the EVSE network portal Operator of the EVSE network portal is connected to: • EVSE database • database that stores data from the financial system • Accounting system or module that directly provides financial information related to each EVSE		
Successful outcome	EVSE operator is able to visualize EVSE connection points on a map, view basic financial performance indicators of his EVSE network and is able to retrieve and adapt selected energy information of a particular EVSE, or group of EVSEs		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSE financial data is not available	EVSE information is not displayed in the financial section of the portal	Energy provider interface with EVSE database or the EVSE network portal is not functioning
Primary actor	EVSE Operator, EVSE network portal		
Secondary actors	EVSE database, Accounting system		

Main scenario	EVSE Operator selects EVSE Financial information tab from the EVSE network portal menu Basic financial statistics of its EVSE network (revenue by time / location / user, utilization of charge poles, cost, basic margin (EBITDA) / EVSE, network, location) are displayed over time (per day, per month) EVSE operator can select a time interval (start day - end day) from a calendar Underneath a drop down menu or buttons with view options are displayed: • aggregation menu (whole network by geo area, only own network by geo area, public / semi public, private, EVSE particular tenants (e.g. airport)) • grouping of charge poles in a particular location menu (charge pools in a parking lot, e.g. ground levels) Selected EVSE are highlighted on a map loaded based on the selected view options Basic statistics from the initial screen are adapted to the selected subset of the EVSE EVSE Operator can view financial information of the selected EVSE: - revenue - cost - utilization - depreciation EVSE Operator can view the above listed data by placing a cursor over the charge pole icon on the map EVSE Operator can click on one or more EVSE (whole selection) and change information such as define charge pool rates for demand management, for advertising, update reservation tariff, update charge rate, parking rate, etc.
Alternatives	-
Variations	-
Related information	-
Issues	-

2266: UC EVSE network maintenance portal

Scope & Level	Value added service (realizing 2259 FTR EVSE network portal)		
Goal in context	Section of web portal to enable EVSE network operator to visualize EVSE connection points with maintenance information about the EVSE viewed at multiple levels with the possibility to set up selected maintenance orders		
Preconditions	EVSE Op is enabled to access and use the EVSE network portal Operator of the EVSE network portal is connected to: • EVSE database (EVSE backend system or central database offered by a 3rd party through the Marketplace) • asset management system that provides information about the maintenance of the EVSE		
Successful outcome	EVSE operator is able to visualize EVSE connection points, view EVSE maintenance data from asset management system and make changes to the EVSE status, schedule events, etc.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	EVSE maintenance data is not available	EVSE information is not displayed in the maintenance section of the portal	e.g. Asset management export to the EVSE operational database is not functioning
Primary actor	EVSE Operator, EVSE network portal		
Secondary actors	EVSE database, Asset management system		

Main scenario	EVSE Operator selects EVSE Maintenance tab from the EVSE network portal menu Basic current status of its own EVSE network (EVSE currently charging displayed in green, EVSE not functioning displayed in red, EVSE not utilized in grey, etc.) Underneath a drop down menu or buttons with view options are displayed: • aggregation menu (whole network by geo area, only own network by geo area, public / semi public, private, EVSE particular tenants (e.g. airport)) • grouping of charge poles in a particular location menu (charge pools in a parking lot, e.g. ground levels) EVSE are highlighted on a map loaded based on the selected view options Maintenance menu is available underneath with 2 options. 1. Search EVSE button - EVSE Operator can select one or more parameters related to the selected subset of EVSE: • last maintenance • last routine inspection • next maintenance scheduled • current status of the EVSE (wear & tear [%]) • likelihood of EVSE breakdown before the next maintenance check [%] • other Table with the EVSE ID, and the status of one or more parameters is displayed EVSE Operator can click on one or more EVSE in the table displayed and assign tasks, schedule and issue work orders, reboot the EVSE, etc. 2. Search maintenance tasks button: EVSE Operator can also search for EVSE based on maintenance tasks. Parameters for this search would include: • Issued work orders • Work orders in progress • Maintenance currently ongoing • EVSE scheduled for maintenance in the next day / week / month • other Table with EVSE ID, status based on the search criteria and other related EVSE maintenance information is displayed
Alternatives	-
Variations	-
Related information	-
Issues	-

2267: UC Driver portal account management

Scope & Level	Value added service (realizing 2258 FTR Driver portal)		
Goal in context	Web or mobile application to enable EV Driver view details of his account and manage his account and assigned RFID cards.		
Preconditions	EV driver is enabled to access and use the Driver portal and has the rights to manage the account data Account data are stored in the EVSP backend system and can be edited		
Successful outcome	EV driver is able to view and manage his account details through the Driver portal		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	EV driver cannot access account data	account data cannot be edited	accounts database not functioning or accessible through the portal
Primary actor	EV driver, Driver portal		
Secondary actors	EVSP		

Main scenario	EV driver selects Account management from the Driver portal menu Account information of the EV driver account (and sub accounts, if applicable) appears EV driver is allowed to change status of sub accounts and adjacent RFID cards, as well as create new RFID card, lock / unlock RFID card, review history of charging on the RFID card EV driver can select and deselect services and options per RFID card: • roaming • willingness to participate in DR schemes • willingness to have commercial offers • premium charging (e.g. one RFID per premium account)
Alternatives	-
Variations	-
Related information	This use case is applicable to both web and mobile versions of the portal
Issues	-

2268: UC Driver portal search, reserve and control charging

Scope & Level	Value added service (realizing 2258 FTR Driver portal)
Goal in context	Part of web or mobile application to visualize EVSE connection points based on search criteria and enable EV driver to reserve a charge pole and select a charge profile (if applicable)
Preconditions	EV driver is enabled to access and use the Driver portal A search engine for EVSE is available to the EVSP who operates the Driver portal EVSP is connected to (directly or through the Marketplace) and has agreement with EVSE operators to enable reservation and possibly profile of charging

Successful outcome	End user is able to connect to a Search EVSE service visualize charge connection points based on search criteria and reserve them, and also choose the charging profile (where contract with EVSE Op allows such option)		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Search for EVSE service is not available	EVSE results of the search do not appear on the portal	Search for EVSE service connection with the EVSP is not functioning
Primary actor	EV driver, Driver portal		
Secondary actors	EVSP, Service provider of a search service,		

Main scenario	EV driver selects Search and reserve EVSE from the Driver portal menu Basic map with EVSE is displayed (based on the set-up the initial map shows whole Europe, country, region, etc.) Drop down menus with search criteria are displayed below for the search by: • availability • type of charging • rate for parking • etc. Driver Selects criteria and presses search Map with highlighted search results (EVSE points in predefined colour) appear to the driver and he can click on the particular pool or single EVSE to expand details and confirm the following options: • possible to reserve (to start charging in the next 30min, or for time interval in the future) • hourly rate of park and charge • rates based on charging profile (connect) • special offers (discounts, coupons, etc.) • possible connections to public transport • POI nearby • other If the details listed above are interactive, the colour is different and hyperlink will allow to choose from options EV driver can select and reserve the EVSE, and choose the profile of charging: • charge now • charge later • charge optimized • other EV driver can select from the advertised special offers (e.g. coupon for free charging) EV driver receives confirmation of the charging session reservation with details about the selected options EV driver is provided with link to driving instructions in GIS or final destination coordinates for the GPS
Alternatives	-
Variations	-

Related information	This use case is applicable to both web and mobile versions of the driver portal. Intermodality application functionality can follow from this point Possibly driver can also control the charging during the charge session (this would require a separate use case and realized in a separate part of the portal
Issues	-

2270: UC Application for authorization and payments

Scope & Level	Value added service (realizing 2258 FTR Driver portal)		
Goal in context	Part of Driver portal mobile application that allows the EV driver to communicate with EVSE, e.g. identify through different means (NFC, QR), apply a coupon before or at the end of charging, pay for charging, and other		
Preconditions	EV driver is enabled to access and use the Driver portal EV driver has downloaded the mobile application of the portal and is using a smart phone (iOS, Android) EVSP is connected to (directly or through the Marketplace) and has agreement with EVSE operators to enable identification and other services through a mobile phone application		
Successful outcome	End user is able to identify at the EVSE and obtain authorization (where contract with EVSE Op allows such option) and pay for charging, unlock services, use coupons, etc.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Mobile phone identification returns an error message on the EVSE display	EV driver is not able to start charging with the use of mobile phone application	EVSE Op backend does not allow such identification

	Payment attempt through a mobile phone application returns an error message	EV driver is not able to start charging with the use of mobile phone application	EVSE Op does not authorize the EV driver
Primary actor	EV driver, Driver portal - mobile application, EVSE Op		
Secondary actors	EVSP		
Main scenario	EV driver selects "Identify at charge pole" in the mobile phone application of the Driver portal EV driver is asked to scan a QR code, enter EVSEID or, launch NFC UC 2249 Authorization through mobile app is launched Options are displayed to the EV driver based on the EVSE capabilities: • authorize charging • apply coupon • special offer • other EV Driver selects an option and UC 2249 continues to authorize through clearinghouse		
Alternatives	-		
Variations	-		
Related information	-		
Issues	-		

2287: UC Integration of car sharing

Scope & Level	Value Added Service(s). Integration between the EVSE operator backend (e.g. Enel EMM system) and the Car Sharing Management System (CSMS) which could be a natural monopoly in each city. This service infrastructure allows the EV Car Sharing Users to access to the EV managed by EV Car Sharing company and the EVSE managed by EVSE Operator, through a dedicated online booking and by using only one RFID card.

<table>
<tr><td>Goal in context</td><td colspan="3">The EV Car Sharing promotes the diffusion and the optimization of the usage of electric vehicles in city contexts where often traffic and congestion problems occur.
To speed up the process and to improve the offer and the quality of the service, two aspects are hereby considered:
- The integration of EVSE operator back-end and CSMS: some information that are present in the EVSE operator backend as Recharge Cable Status, or State of Recharge, are fundamental also in the CSMS, to optimize the booking algorithm and maximizing the frequency of access to the service.
- Managing a unique RFID Card to access the EV and to the EVSE to start/end recharge operations should improve and simplify the usability of the service.</td></tr>
<tr><td>Preconditions</td><td colspan="3">• The CSMS must be connected to the on Board System inside the EV, with the aim of authorizing the opening of the car, and retrieve and collect data from the EV (e.g. service battery level, ignition key status and door look status.)
• A communication channel should be created between EVSE operator backend and CSMS (e.g. web services) in order to exchange the information needed for authorization and recharge process.</td></tr>
<tr><td>Successful outcome</td><td colspan="3">The EV Car Sharing User makes a reservation and is allowed to use the EV just with one authentication.</td></tr>
<tr><td>Failure outcomes</td><td>Failure</td><td>Outcome</td><td>Condition leading to outcome</td></tr>
<tr><td></td><td>No communication between EVSE operator backend and CSMS</td><td>The EV Car Sharing User has to identify himself twice (and with two different cards) once with the EVSE and one with the EV.</td><td>Different kind of communication problems.</td></tr>
<tr><td></td><td>Unauthorized parking in the Car Sharing Parking Area.</td><td>Car Sharing user cannot return the car and recharge it. This could cause some delay for the next car sharing user: he/she won’t be able to access the car at the reservation time.</td><td>Unauthorized users occupy the EV park area.</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary actor</td><td colspan="3">EV Car Sharing User, EVSE, EV</td></tr>
<tr><td>Secondary actors</td><td colspan="3">EVSE operator backend, CSMS, On Board Unit</td></tr>
</table>

Main scenario	(Authentication and EV removal) The EV Car Sharing User books the EV through the CSMS and On Board Unit is informed of the reservation. The Car Sharing User swipes the RFID card on the EVSE Card reader. The EVSE operator backend sends a message to the CSMS asking to confirm the reservation. The CSMS confirms the reservation The EVSE communicates to the On Board Unit that the user is authorized to access the EV (doors are opened) The EV Car Sharing User can unlock the cable and access the EV .
Alternatives	Use a local white list for the reservations, or use two different RFID Cards, one to unlock the cable from the EVSE and another one to access to the EV.
Variations	
Related information	
Issues	

2288: UC Direct Payment w and w/o service contract on multi-vendor charging infrastructure

Scope & Level	Value Added Service infrastructure. Allows EVs users to pay the charging service through a direct payment method, e.g. a smartphone application, with or without a B2C service contract with an EVSP. Enabling technology for direct payment could be Near Field Communication (web and SIM based) and QR code reading application. A whole set of B2B and B2C services would be realized within this VAS infrastructure

Goal in context	The goal of this VAS infrastructure is to enable random EV customer to access charging service and perform direct payment without necessarily having a service contract in place. In case of using a smartphone application which retrieves the EVSE information through NFC, the NFC permits a fast and easy mobile payment for the recharge. In order to enable such scenario, the relevant information chain must be established between EV user, EVSE and EVSE Operator back-end, allowing for EVSP and Telecom Operator to step into the scenario according to the specific payment technology. In the more general scenario, the EV random user might choose at the EVSE a specific EVSP to by charging service from. In order to accomplish this goal, the EVSE ID needs to be retrieved at first from the EVSE. Such information could be harvested by multiple means, e.g. a smartphone application with a bidirectional NFC communication able to retrieve EVSE ID from the EVSE, a manual read of EVSE ID to be inserted in smartphone application front-end, a QR reading of EVSE ID. Once the EVSE ID information (including the EVSE Operator) is known to the smartphone application, the EV user might choose an EVSP and select it according to pricing conditions (when there is not a general B2C service contract in place) or can simply start the charging service when the smartphone application itself is already branded by a specific EVSP. Finally, charging service authentication request is sent by the smartphone application to the EVSP or EVSE Operator according to the technical implementation of the VAS infrastructure. The payment method could easily be web based as no established SIM based infrastructure is in place at the time of writing these business requirements. This VAS infrastructure needs an end-user capable smartphone application and, according to different payment and communication options, specific technical requirements on EVSEs.		
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 EVSE Op is connected to the EVSP in order to register the recharge. • The EVSP is connected to the Telephone Operator/Bank . • The EV user has a capable smartphone application		
Successful outcome	The phone properly connects with the EVSE and the EV recharge and the payment are carried out correctly.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**

	The mobile runs out of battery	The mobile cannot connect to the EVSE and consequently there is no communication NFC.	Lack of mobile phone battery capacity
	No GPRS communication between EVSE ad EVSE Op. back-end	The EV User cannot recharge the EVSE. .	Lack of communication
Primary actor	EVSE, EV user		
Secondary actors	EVSP, EVSE operator, EVSP, Telephone Operator		
Main scenario	- The smartphone app retrieves The necessary information from EVSE - The smartphone app forwards The customer information to EVSE Operator - The smartphone app checks The payment information upon payment enabling method - The smartphone app forwards authentication request after having checked payment capability - The EVSE Operator back-end authorizes charging process		
Alternatives	RFID		
Variations	smartphone application may be already branded by a specific EVSP		
Related information			
Issues	This VAS infrastructure needs an end-user capable smartphone application and, according to different payment and communication options, specific technical requirements on EVSEs.		

2289: UC Signalling ICE vehicle inappropriately parking

Scope & Level	Value Added Service infrastructure. Detection of a non electric vehicle, such as ICE (Internal Combustion Engine) vehicle, in an EV public reserved/dedicated parking lot and monitoring its status through EVSE using a parking sensing system.		
Goal in context	The detection of the EV dedicated parking lot is crucial in the big city, since EV parking lots are often taken by non Electric Vehicle. In this way, detecting the parking lot, an EVSE is able to discriminate the presence/absence of a car and in case of presence, if a charging session is not started in X minutes, it is able to understand the type of the vehicle (ICE). After detecting a No EV, the EVSE can inform the EVSE Operator Back End and a request for towing the car can be sent to the responsible institution (e.g. local police).		
Preconditions	1. A sensor has to be buried to detect the presence/absence of vehicle in the EV dedicated parking slot. 2. The sensing system (sensor and communication) has to be connected to the EVSE. 3. The EVSE forwards the information to the EVSE Operator back-end, which in case the parking lot is not empty and a concurrent charging session is not present, detects the inappropriate parking.		
Successful outcome	Reduce the possibility to find a parking lot occupied by a No-EV and allow public EV charging.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Failure of the sensing system	EVSE is not able to realize if the parking lot is empty or not.	Failure either in sensing or in communication with the EVSE.
	Absence of communication between EVSE and EVSE Operator Back End	EVSE recognizes the status of the parking lot but the information cannot be sent to EVSE Operator Back End	Lack of communication.

	Failure of the RFID reader	EV user is not able to identify himself. After verifying the malfunction of the RFID reader, the EV user should check another available EVSE using dedicated applications. Anyway, in case the parking lot is not empty, the request for towing can be forwarded from EVSE Operator back end. The parking lot is only valid for EVs during charging.	Impossibility/failure in the identification of the EV user.
Primary actor	EVSE, EV; EV user		
Secondary actors	EVSE operator, Public institution		
Main scenario	1. EVSE shall recognize the presence of a vehicle in the EV parking lot using dedicated parking sensor to retrieve whether the vehicle is BEV/PHEV or not. 2. Customer shall identify himself passing RFID close to the EVSE reader and afterwards identification and authentication the charging session can start 3. In case of ICE vehicle, customer will not identify himself/herself and within 3 minutes the EVSE will inform the EVSE Operator Back End that the customer is not EV user 4. The EVSE Operator Back End shall send the indication of the parking lot busy to the police for towing, according to the municipalities rules"		
Alternatives			
Variations			
Related information	This is a business use case to be providing local institution with updated data regarding inappropriate parking at EV public stations. This business service, that will be detailed in specifications phase, requires dedicated developments that involve: - The installation methodology of public station (sensing system needs to be buried) - An additional field communication channel between the sensing system and the EVSE (besides the one already existing between EVSE and EV and EVSE and EV user) - The back-end algorithm of the detection system in EVSE Operator back-end (which basically performs a logic AND between the parking information and the concurrent charging session) - The business service itself for which the Specs phase delivers data request/response, informing the local institution of parking infraction."		

Issues	

2290: UC Internet access at EVSE

Scope & Level	Value Added Service The EVSE allows free internet access to both EV users e non EV users. The EV user may be authorized to freely access the Internet together with the charging authorization. The non EV user may access the Internet through a pay-per-use contract/prepaid. The internet access is performed through mobile devices only.		
Goal in context	The EVSE infrastructure deployment may serve as a fundamental pillar of a broadband hot-spot wireless network for Internet access through EVSEs installed in semi-public places (airports, megastores, maxi cinemas)		
Preconditions	1. The EVSE embeds multiple 4G connectivity with enabled SIMs able to convert the cell network signal into local WiFi. 2. The EVSE Operator back-end ensures security, privacy and compliancy to local regulation by deploying dedicated enhanced software to manage the connection.		
Successful outcome	The VAS is delivered to the user.		
Failure outcomes	**Failure Outcome**	**Condition leading to outcome**	**Condition leading to outcome**
	Failure of connectivity	No internet access for the user	Lack of connection
	Failure of service authentication	No internet access for the user	Lack of data transmitted via EVSE-EVSE Op. back-end communication protocol.

Primary actor	EV User, EVSE
Secondary actors	EVSE Operator, Telecom Operator
Main scenario	• The EV user near to the EVSE is informed of free access to broadband internet connection to check e-mails, download music, etc. • The EV user is authorized to freely access the Internet through charging authentication • EV user surfs the Internet while charging • EV user access to the Internet ends with the end of the charging process and disconnection of the EV
Alternatives	• A non EV user near to the EVSE is informed of free access to broadband internet connection to check e-mails, download music, etc. • The non EV user authenticates through smart phone authentication • EVSP authorizes the non EV user the per-per-use access to the internet • non EV user surfs the Internet • EVSP charges the service usage to the non EV user
Variations	
Related information	This is a B2C service intended to be provided by EVSP to the EV user through a dedicated HW and SW infrastructure deployed by the enabling EVSE Operator. The EVSE Operator performs 4G connectivity deployment in the EVSE and manages local Wi-Fi rerouting and customer data identification. The connectivity is guaranteed by 4G coverage and traded through specific B2B contracts between EVSE Operator and Telecom Operator, allowing for pricing deleveraging through advertising. Although the business requirements and possibly future specifications might be intended for the B2C service, it is of no need if the needed HW and SW modules are put in place in the EVSE.
Issues	Costs of 4G connectivity deployment and local Wi-Fi rerouting might lead to possible application of the B2C service only if its infrastructure costs get put in the context of EVSE cost, in a general, regulated and subsidized infrastructure deployment to enable Smart Cities vision.

2323: Probe data collection

Scope & Level	Value added service		
Goal in context	Collect and store data about journeys via GPS data. Information includes point of departure, route, range, travel time and destination).		
Preconditions	End user must have applications installed on smartphone and allow application to track smartphone position. Smartphone has internet connection and sends location data.		
Successful outcome	The application collects data about trips and stores it into personalized user profile.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No current journey	Vehicle/smartphone location is not tracked	Data collection has not been initiated
	Journey data not stored	Tracked journey is not stored into personalized user profile	Corrupt data collection
Primary actor	Application provider		
Secondary actors	EV Driver		
Main scenario	In order to be able to analyze the vehicle usage pattern of a specific user it is necessary to collect and store data. Every time the driver starts a trip the app records the route and distance. This recording could either be initiated manually by the user with the push of a button or alternatively started automatically by detecting car movement. If the latter is not feasible it could also be possible to send a push-notification to the user as soon as movement is detected via GPS data. Consequently, the user confirms that he is driving his car or denies the enquiry as travel is done with other modes of transportation (e.g., train, bus, bike, taxi). Once the data collection is started, the application records the routing information (point of departure, route, range, travel time, destination). This is repeated for every trip within a specified period of time (for example one month) and eventually the data collection will be compiled		
Alternatives			
Variations	a) Data collection is initiated manually by the user b) Data collection starts automatically		

Related information	-
Issues	-

2324: Journey analysis

Scope & Level	Value added service		
Goal in context	Analyze trips of users and checks the range possibilities for the EV.		
Preconditions	Probe data has successfully been collected and stored into personalized user profile (UC 2323) EVSE locations are stored in database.		
Successful outcome	The application analyses trips for the route and whether EV usage would have affected this or not (if yes, to what extent - e.g. time, transfer to public transportation). Moreover the application calculates total mileage for user profile.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No EVSE data available	Possible charging locations on the route can not be identified	Missing EVSE data (location + availability)
	No public transportation data available	Potential transfers to public transportation can not be considered	Missing connection to public transportation data (e.g. Intermodality Planning application)
Primary actor	Application provider		
Secondary actors	EV Driver		

Main scenario	• The recorded travel data is used to reconstruct the particular trips as if they would have been undertaken with an electric vehicle. • This comprises mainly the route and range of the trips. • Assuming that the user has the possibility to charge the EV at home and hence starts the trip with his fully charged vehicle, the travelled range will indicate whether the daily trips would have been in the range of the EV. • Moreover, the system includes data from existing charging stations and could therefore also simulate a charging process if one was needed (distance of EVSE, time, expense). • Assuming that the EV is charged over the night, costs must be allocated to this charging process (Average per kWh or in real-time) • If the user has completed long-distance trips that significantly exceed the range of current EVs the application should consider alternative modes of transportation like public transportation and calculate the impact on travel time and cost (Assumption: Train/Bus runs one time and tickets are issued at standard price).
Alternatives	
Variations	
Related information	It is assumed that the user had the possibility to charge an EV at home, hence starting the journey with a full battery.
Issues	

2325: Assessment of usage pattern

Scope & Level	Value added service		
Goal in context	Use collected and analysed journey data to draw comparison between usage of internal combustion engine (ICE) versus EV usage. The results compare cost of transportation, CO2 emission and travel time.		
Preconditions	Journeys have successfully been analyzed (UC 2324) Database provides relevant technical information to compare vehicles Cost of energy is known (average price per kWh or in real-time) Cost of fuel is known (average price per litre or in real-time)		
Successful outcome	The application enables driver to compare his current vehicle with potential EVs in terms of cost and convenience.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	Cost of energy or fuel is not available	Cost comparison not possible	Missing data

	Journey data not stored	Tracked journey is not stored into personalized user profile	Corrupt data collection
Primary actor	Application provider		
Secondary actors	EV Driver		
Main scenario	The value-add of the EV awareness application is to point out the impact of an EV while considering the current usage pattern of a specific driver. • The user will be prompted to select the car he is driving at the moment. The database should hold the most common vehicles (with internal combustion engines) available and retrieve relevant data like the average gas consumption and emissions (alternatively, user is able to estimate empirical values manually). • On that basis, the application is able to calculate the aggregated cost of gas (Mileage * Avg. Consumption) and CO2 emissions for stored user profile. • On the other side, the user is able to select a specific EV of his choice (availability dependent on OEM participation) and compare the results. The database again provides technical data like the EV range. • Consequently, the app is able to tell the user in how many cases there would have been no impact on the usage pattern (sufficient range) and what trips would have caused difficulties. • The user is able to select those "critical trips" one by one in order to understand the impact of EV usage (e.g. increased travel time due to EV charging, transfer to public transportation). Overall, the app draws a comparison between the current vehicle and the selected EV with respect to the following key figures: 1) Cost of transportation (Gas versus energy + public transport) 2) CO2 emission/savings 3) Impact of travel time		
Alternatives	User is able to estimate total cost of fuel manually instead of using calculations.		
Variations	Possible Addition: *OEM Lead Management* If OEMs are interested the application draws the comparison for specific models. Additionally, this could be enriched by further information about the vehicle (Commercials etc). Moreover, the potential customer would be able to directly get in touch with the OEM. The other way around, OEMs could send personalized offers to the drivers.		
Related information	-		
Issues	-		

2331: UC Perform Telematics-based Smart Charging

Scope & Level	Value added service		
Goal in context	Perform Telematics-based smart charging of the EV (via OEM V2B link to the EV)		
Preconditions	• End user has enrolled and registered for this service offering by the EVSP. • EVSP has agreement with OEM using the V2B link for smart charging purpose • End user's Smartphone (or EV) has internet connection and sends location data. • The EV is "Smart Grid" enabled and supports the smart charging process		
Successful outcome	The end user's EV is being "smart charged" according to the EVSP optimised charging plan.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
	No charge plan can created	Optimized charge plan cannot be created	No location is provided
Primary actor	EVSP, End-User, OEM, EV		
Secondary actors	Demand Clearing House, DSO		
Main scenario	Being at home or at the work location the end user plugs his EV into a "non-smart" electric plug for charging. Using either his Smartphone or an In-Vehicle HMI the end user selects the various charging options based on his needs: a) Fast Charging; b) Smart Charging based on lowest cost, c) Smart charging based on other constraints, such as distance or charging level. Once selected by the end user, the EVSP or any other service provider calculates the charging plan for the EV using the location information and sends it via the OEM V2B communication link to the EV to start the charging process based on users selected preferences. Each time the user is able to monitor the charging process of his EV using the same communication link via the OEM V2B. Once the charging process has completed, the user disconnects the plug and ends the charging process.		
Alternatives			
Variations	None		
Related information	-		
Issues	-		

2332: UC Register for Telematics-based Smart Charging

Scope & Level	Value added service		
Goal in context	Register for Telematics-based smart charging of the EV (via OEM V2B link to the EV)		
Preconditions	• EVSP has agreement with OEM using the V2B link for smart charging purpose • The EV is "Smart Grid" enabled and supports the smart charging process		
Successful outcome	The end user's EV is being registered for "smart charged" according to the EVSP optimised charging plan and receives incentives. The "smart charging" option is activated in the EV and the end user has installed a "Smart-Charging" application from the EVSP to select the smart charging options or is using the in-vehicle HMI for controlling/selecting the charging options.		
Failure outcome	**Failure**	**Outcome**	**Condition leading to outcome**
Primary actor	EVSP, End-User, OEM		
Secondary actors			
Main scenario	The end user would like to register his EV which is "smart grid" enabled for smart charging purpose. By doing this he will receive incentives from his EVSP for selecting "smart charging" option when charging at home or at work. The end user registers for this service at his EVSP utilizing his "smart grid" enabled EV. The EVSP has agreements with the OEM to utilize the V2B communication link. Once the registration process has successfully completed the EV "smart-charging" option is set in the EV and the end user installs the "Smart-Charging" application on his smartphone.		
Alternatives	If EVSP is also an OEM, then no agreement between OEM and EVSP is required.		
Variations	None		
Related information	-		
Issues	-		

Roaming Use cases

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	-		

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	-		

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	EVSP receives correct service data record (SDR) which includes the charge data record in order to enable billing, reporting and statistics		
Preconditions	Charging via active Roaming Charging Process.		
Successful outcome	Charging Process successfully ends. SDR is routed correctly.		
Failure outcomes	**Failure**	**Outcome**	**Condition leading to outcome**
	Failure to send SDR	SDR is not received and billing cannot be calculated correctly.	• Connectivity issues • Backend issues
	SDR contains wrong but consistent 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 SDR. SDR is evaluated by clearing house and forwarded to responsible EVSP backend		
Alternatives	-		
Variations	In the current release 1 the SDR is directly send from EVSE Operator to the clearing house and also directly forwarded to the responsible EVSP. This could also be done for all the SDRs in a particular time frame such as a week or a month. In this case, the EVSE Operator could send the SDRs directly to the clearing house but the latter one could send them to the responsible EVSP after i.e. the end of a month. Each SDR would still be a single transaction resulting in a single service call.		
Related information	see Business Process Diagram 1452 Contract Clearing - SDR Forwarding		
Issues	-		

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	The use case starts when the clearing house gets an authorization request form an EVSE operator who has noticed a charging request at one of his charge points which was not triggered by one of his own customers. After retrieving the authorization request, the clearing house performs two checks. First the B2B contract is checked. That means, do the EVSE operator and the EVSP, to whom the unknown customer belongs, a valid roaming agreement. The second check validates the B2C contract. For that it has to be verified that the customer is entitled to charge at that particular charge point of the EVSE operator. According to the outcome of those two checks, the clearing house permits or denies the authorization request and notifies the requesting EVSE operator backend.		

Alternatives	Authorization is done bilaterally between EVSPs/EVSE operators. see use case xxx Charging is started anyway and customer is billed directly at charge point site. The authorization is not requested by the EVSE operator but pushed by the EVSP. see use case 2249.
Variations	The B2B contract information can reside directly in the clearing house or can be retrieved via another central instance i.e. a marketplace. The B2C contract information can reside in the clearing house or can be retrieved from the corresponding EVSP directly.
Related information	see Business Process Diagram Contractual Clearing - Authorization 1270
Issues	-

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.

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	-

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	-

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.

1517: UC Change Customer Contract by Customer himself within Clearing

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 access 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	-

Energy Use cases

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 operator 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

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			

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 EVUs 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	-

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 behaviour 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 recharge.	There would be no chance to deliver such information to the stakeholders.	Lack of communication or lack of compliancy to ISO15118 where EV-EVSE communication 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	-

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 customers 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 EVSE operator 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	-		

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 recharging 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 EVU 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 Operator. 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 Operator) 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			

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 predefinition 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 fulfilment 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

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 signalling 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 EVU 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 aggregates 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 EVU 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 fulfil 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 signalling regarding the V2G supply should be managed.		
Issues	Regulation and local legislation		

1605: UC Reserve and activate ancillary services

Scope & Level	Value Added service. An EVSP offers aggregated energy as ancillary service to the DSO in order to help the DSO to fulfil 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
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		