



HEAVY DUTY VEHICLE (HDV) BOOKING

Towards a standard way of information sharing to accelerate the booking and charging possibilities for HDVs.

Version 2.1

December 2024

This document is DRAFT and no rights may be derived from this document. It contains an overview of Business Use Cases with the focus on enabling booking of charging infrastructure for Heavy Duty Vehicles.

The UCs are defined by Contributors of the EVRoaming Foundation. Feedback and comments will also be processed by this group.

Organisations that are committed, can join this group by becoming a Full Contributor of the EVRoaming Foundation.

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Business Use Cases

Introduction

This document describes the first setup of the relevant (Business) Use Cases for the Heavy Duty Vehicle booking of charging stations. To get a complete overview, also use case about the charging sessions are described with the relevance for heavy duty usage in combination with a booking.

These use cases do not describe the full charging process e.g. UCs about authorization and payment when not directly relevant for the booking process are left out of this document as it are existing and running processes.

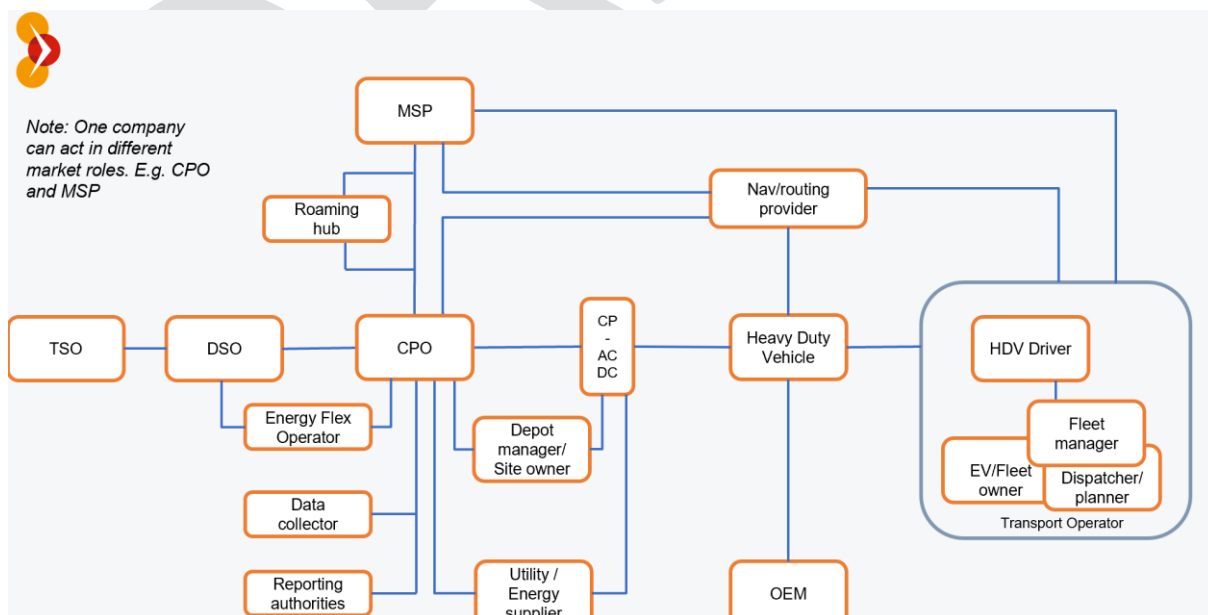
The document start with information about the Eco-System as defined and agreed between the members of the HDV Booking Task Group. After that some additional information is submitted which should make it easier to understand the Business Use Cases. E.g. difference between operator and service providers, situation for booking via 3rd party, the relation between CPO and the Transport Operator.

Following is an overview of the headers/titles of the Business Use Cases, followed by the details of each of them. That should result in a total overview of Booking Use Cases.

Not yet taken into account is dynamic booking e.g. automatically shift booking slots based on traffic or weather information. That will be discussed in the next phase.

HDV Charging Eco-system

The UCs are based on the roles and model as presented in the following Eco-system overview. More information about the specific roles can be found the Eco-system presentation. This model can be modified based on new insights via Use Cases.





Difference between operator role and service provider role

Activities related to services to other parties are seen as activities executed and belonging to a Service Provider role. This can be a Mobility Service Provider (MSP) offering access to a charger, but can also be a party offering only booking services. Even if that party is also operating charging stations, the booking service belongs to the Service Provider role of that party, while the operating of the charging stations belong to the Charge Point Operator (CPO) role of that party. Navigation and Routing providers also belong to Service Provider role. This can be compared with the Ad Hoc access which operators of charging stations need to offer: this is a service provider activity executed by the operator.

Booking via a 3rd party

In the Eco-system and the Business Use Cases, the role of a separate booking party is not described, but it is taken into account. Booking is a service and can be done in many ways by many parties. A MSP or CPO can also outsource that activity to a 3rd party, e.g. like booking websites are doing for hotels. In the eco-system this is seen as an activity of a mobility service provider, which can be a different entity than the one submitting the access tokens and managing the invoice. This is also how it is seen in the Business Use Cases. In other words: the use case describing MSP books at CPO should not be too restrictive on the actual Service provider.

Interaction between CPO and Transport Operator

The Business UCs contain situations where there is interaction described between CPO and the Transport Operator. On functional and technical level this information goes via a service provider, which can be the same company/entity as the CPO. From business perspective the Operator communicates with the TO.

Booking of single charge point or one of a group of charge points

The Business UCs do not make a difference if one specific charge point is booked or if one of a group is booked. Both methods should be supported:

- Situation where the TO want any charge station at a certain location to be available taking into account the requirements for e.g. availability, power, connector, etc. In this case either before arriving or when arriving the specific charge station is shared with the HDV driver
- Situation where the TO selects a specific charge station based on the entered requirements. In this case directly the charge station is connected to this TO for that timeslot.

It is also possible that the TO wants a charging possibility with specific requirements and in a certain geographical area. This can either be from the same CPO, if booking is



done directly at a CPO, or with different CPOs when offered via MSP or special booking service. It is up to the services to define and offer this functionality.

Sharing booking terms with TO

When making or changing a booking, the TO wants to know the different terms related to the booking. E.g. different time slot windows, different booking fees, until when booking can be changed, etc. This need to be shared via the CPO to the MSP to the TO. Besides standard supported data sharing about time slots and tariffs, sharing other terms are not part of the described Use Cases in this document.

The required functionality will be discussed separately, as it is probably not exclusively related to booking but also to standard usage of charging infrastructure.

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User Story

Overview

1. Find bookable charging locations & charge points.
 - a. Find function including power, green energy, etc
2. Find time slots available for booking at charging locations and charge points.
 - a. Including things like guaranteed power, green energy, etc.
3. Create and manage booking of time slots at charging location or charge point.
 - a. Including energy volume
 - b. Include a request for “green energy”, etc as well?
4. Charge at a booked charging location or charge point
5. Pay (Transport Operator (TO) to MSP) / Settlement (MSP to CPO)

Notes

A booking must include:

- *Charge station or list of compliant (group) of Charge stations*
- *Reservation Date*
- *Reservation expiry Date*
- *Booked Time slots*
- *Booking Tariff*

A booking may include also :

- *Charging services tariff*
- *Reservation charging preferences (energy volume, energy type (e.g. renewable, fossil free, unspecified),*
- *and price (for booking time slots and charging)*

Booking use cases complement and exist side-by-side with the regular OCPI use cases and contain the components of a booking as far as possible in line with existing OCPI components.

The UCs do not describe the User Interfaces of systems. E.g. A UC can describe that the CPO shares information with Navigation provider. The UC does not describe if the Navigation provider is using that to show one or several routes.

The Use Cases are divided in the following categories:

1. UCs about Charge locations: search and find
2. UCs about Managing the booking of a charge station and charge slot
3. UCs about Managing the charging session
4. UCs about Managing the payment and settlement



BUSINESS USE CASES

1. UCs about Charge locations: search and find

[BUC 1.1] As a CPO, MSP or Navigation Provider I want to send/share information about HDV charging locations with the TO, based on certain preferences set by the TO, based on a certain route.

[BUC 1.1.1] As CPO I want to give the MSP and Navigation providers and Data Collectors (e.g. NAP) information about HDV charging locations with booking possibilities, including fees (reservation, cancellation, no or late show, blocking fees, overtime penalties) and other pricing and reservation policies.

[BUC 1.1.2] As CPO or MSP or Navigation provider I want to give the Transport Operator information about HDV charging locations with booking possibilities, including fees (reservation, cancellation, no or late show, blocking fees) and other pricing and reservation policies.

[BUC 1.1.3] As CPO I want to give the MSP and Navigation providers information about HDV charging locations that can only be used when booked - if not booked they cannot be used, including fees (reservation, cancellation, no or late show, blocking fees) and other pricing and reservation policies.

[BUC 1.1.4] As CPO or MSP I want to give the Transport Operator information about HDV charging locations that can only be used when booked - if not booked they cannot be used, including fees (reservation, cancellation, no or late show, blocking fees) and other pricing and reservation policies.

[BUC 1.2] As TO I want to find time slots available for booking at charging locations and charge points that enable a transport mission. (*Difference with BUC 1.1: this is about available time slots, where BUC 1.1 is about bookable locations/EVSEs.*)

[BUC 1.2.1] As an MSP, I want to provide information to the TO about time slots available for booking at charging locations and charge points to transport operators.

[BUC 1.2.2] As a CPO, I want to offer MSP and TO time slots available for booking at charging locations and charge points.

[BUC 1.2.3] As a CPO, I want to update time slots offered to TO and MSP for booking at charging locations and charge points when availability changes (for any reason).

2. UCs about Managing the booking of a charge station and charge slot

[BUC 2.1] As a TO I request to the CPO with my MSP UID a booking of time slot at charging location of a specific charge point and/or specific connector type and/or specific power (eg. min /max power delivered), so that I know that I will be able to get the required energy when needed. This, as far a guaranteed min power is possible/can be submitted.



[BUC 2.2] As an MSP, I want request booking of time slots for a location or charge point for any or specific MSP users

[BUC 2.3] As a TO I want to manage my booking using my MSP UID.

[BUC 2.3.1] As a TO I want to change / reschedule booked time slot

[BUC 2.3.2] As a TO I want to change the booked charger or connector type or requested power (eg. min / max power delivered)

[BUC 2.3.3] As a TO I want to cancel the total booking

[BUC 2.3.4] As a TO I want to be able to manage my booking and replace it with another location or another chargepoint of the same CPO (as a TO i want to cancel an existing booking and replace it by a new one)

[BUC 2.4] As an MSP, I want to request modification or cancellation of an active booking.

[BUC 2.5] As a TO I want to receive information when booked charging station is not working correctly, prior to arriving and during a session.

[BUC 2.6] As a CPO, I want to confirm creation to the TO, modification or cancellation of an active booking based on booking requests

[BUC 2.7] As a CPO: I want to modify and cancel active bookings because of unexpected maintenance / outages and inform TO and the MSP

[BUC 2.8] As a CPO I want to send alternative charging booking suggestions to MSP and/or TO, if there is an unexpected maintenance/outage.

[BUC 2.9] As a CPO I want to offer modification / cancellation to MSP and TO but not longer than > Xh in advance

[BUC 2.10] As a MSP I want to send a reminder to TO about an upcoming active booking

[BUC 2.11] As a TO I want to be informed by MSP with info from the CPO about the status of my active booked charging sessions and if it has been expired (charged successful / no show).

3. UCs about Managing the charging session

[BUC 3.1] As a CPO, I want to validate the correct reservation holder is attempting to start the charge, whatever the authentication mode is (15118 PnC; RFID, etc).

[BUC 3.2] As an MSP, I want to authorize users to perform charging at a charge point or location. (*Note: This user story is covered by existing OCPI functionality*)

[BUC 3.3] As a Transport Operator, I want to initiate, perform, and end charging at a charge point.



[BUC 3.3.1] As a Transport Operator, I want to initiate, perform, and end charging at a charge point within my booked time.

[BUC 3.3.2] As a Transport Operator, I want to initiate charging at a charge point earlier than my booked time if possible.

[BUC 3.3.3] As a Transport Operator, I want to end charging at a charge point after my booked time (when charging is finished outside booked period).

[BUC 3.4] As an MSP, I want to provide information to the TO about the possibility to initiate charging at a booked charge point.

[BUC 3.5] As an MSP, I want to provide information to TO about the need to end charging at a booked charge point e.g x minutes before time slot is ending or x minutes before vehicle reached a set SoC.

[BUC 3.6] As a CPO, I want to end charging at a booked charge point when charging is no longer allowed.

[BUC 3.7] As a CPO i want to get notified when a TO/driver stops the charging session ahead of time (so that the connector is back available for potential waiters) – *(This can be developed and done by internal CPMS system from CPO based on signal of Stop Transaction.)*

[BUC 3.8] As CPO I want to share charge session progress and updates with TO e.g. how much time left, SoC, charging power, etc – *(This can already be done via the MSP using session information.)*

[BUC 3.9] As a CPO I want to reject attempts to start a (remote) charge for a reserved charger with informed error messaging

[BUC 3.10] As a TO/Driver, I want to report to the CPO a charger is blocked/broken and recover reservation fee

[BUC 3.11] As a CPO you want to get in touch with the Driver during the charging session

[BUC 3.12] As a CPO: I want to authorise trucks by licence plaid or code to enter the charging location

4. UCs about Managing the payment and settlement

[BUC 4.1] As a Transport Operator, I want to know my consumption and to pay for booked time slots and charging

[BUC 4.2] As a CPO I want to charge a TO / MSP a now show penalty in case an active booking is not used (optional)



[BUC 4.3] As a CPO I want to charge a TO / MSP an overtime penalty if the HDV is still plugged even though the reservation no longer allows it to be. *(This can be similar to rotation tariff)*

[BUC 4.4] As a CPO, I want to provide price information of the charging session to the MSP and get payment for booked time slots and charging

[BUC 4.5] As an MSP, I want to provide price information of the charging session and get payment for booked time slots and charging from Transport Operator.

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1. UCs about Charge locations: search and find

[BUC 1.1] As a CPO, MSP or Navigation Provider I want to send/share information about HDV charging locations with the TO, based on certain preferences set by the TO, based on a certain route.

Objective	The TO receives up to date Locations information, based on his/her requirements
Description	The NSP, MSP, TO and Data Collectors want to know where they or their users can charge their HDVs
Pre-conditions	
Functional UCs	tbd
Actors	CPO, MSP, NSP, TO
Flow	
Remarks	<ul style="list-style-type: none"> This requires information about vehicle type (can an HDV type charge at this location), information about available power, information if and how it can be reserved, information about tariffs including booking components, and information about additional location facilities

[BUC 1.1.1] As CPO I want to give the MSP and Navigation providers and Data Collectors (e.g. NAP) information about HDV charging locations with booking possibilities, including fees (reservation, cancellation, no or late show, blocking fees, overtime penalties) and other pricing and reservation policies.

Objective	The MSP, NSP and DCs receives up to date Locations information, from the CPO
Description	The NSP, MSP and Data Collectors want to know where their users can charge their HDVs. This information is coming from the CPO regarding Location/EVSE info and CPO fees. For the TO, additional fees can be added by the MSP.
Pre-conditions	<p>CPO has all location and station information available (static and dynamic) and know which charges stations can be booked with following info:</p> <ul style="list-style-type: none"> - Vehicle type (only truck types need to be shared) - Bookable y/n - Applicable fees: Reservation, cancellation, no or late show, blocking fees, overtime penalties) - Link to pricing and reservation policies
Functional UCs	tbd
Actors	CPO, MSP, NSP, Data Collectors, TO



Flow	- CPO send info about location and EVSE and charge parking bay to MSP/NSP/DC
Remarks	<ul style="list-style-type: none"> This requires information about vehicle type (can an HDV type charge at this location), information about available power, information if and how it can be reserved, information about tariffs including booking components, and information about additional location facilities

[BUC 1.1.2] As CPO or MSP or Navigation provider I want to give the Transport Operator information about HDV charging locations with booking possibilities, including fees (reservation, cancellation, no or late show, blocking fees) and other pricing and reservation policies.

Objective	The TO has the correct info to know which stations at what cost and policies he/she can book.
Description	See BUC 1.1.1 This is same data and same process. Either TO get this information from MSP or the NSP. Or the TO receives this information via the service provider part of the CPO.
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	- Communication between MSP/NSP and TO is done via own protocols and systems. Can be via app or website. In certain situations companies also use OCPI protocol to share this with TO systems. That is up to the parties and does not require additional/new OCPI services.

[BUC 1.1.3] As CPO I want to give the MSP and Navigation providers information about HDV charging locations that can only be used when booked - if not booked they cannot be used, including fees (reservation, cancellation, no or late show, blocking fees) and other pricing and reservation policies.

Objective	The MSP, NSP and DCs receives up to date Locations information, from the CPO for locations that can ONLY be used after booking.
Description	See BUC 1.1.1 Exactly the same but only for chargers that can only be used when booked.
Pre-conditions	



Functional UCs	
Actors	
Flow	
Remarks	

[BUC 1.1.4] As CPO or MSP I want to give the Transport Operator information about HDV charging locations that can only be used when booked - if not booked they cannot be used, including fees (reservation, cancellation, no or late show, blocking fees) and other pricing and reservation policies.

Objective	The TO has the correct info to know which stations can only be uses with a booking and at what cost and policies he/she can book.
Description	See BUC 1.1.2, for stations that can only be used with a booking.
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	

[BUC 1.2] As TO I want to find time slots available for booking at charging locations and charge points that enable a transport mission. (*Difference with BUC 1.1: this is about available time slots, where BUC 1.1 is about bookable locations/EVSEs.*)

Objective	The TO receives up to date available time slot information, based on his/her requirements (incl chosen charge stations)
Description	The NSP, MSP, TO and Data Collectors want to know the available charge slots of charge stations where they or their users can charge their HDVs
Pre-conditions	
Functional UCs	tbd
Actors	CPO, MSP, NSP, DC, TO
Flow	
Remarks	<ul style="list-style-type: none"> Knowing already the bookable charging station, the info about available charge slots must be shared. This can be based on a selection of chargers either in a certain area or along a certain route / corridor.



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[BUC 1.2.1] As an MSP, I want to provide information to the TO about time slots available for booking at charging locations and charge points to transport operators.

Objective	The MSP receives up to date information about available timeslots for specific charge stations, from the CPO that can be shared with their users/TO's.
Description	The NSP, MSP and Data Collectors want to know the available time slots when their users can charge their HDVs. This information is coming from the CPO.
Pre-conditions	CPO has all location and station information available (static and dynamic) and know which charges stations can be booked at what times with the following info: <ul style="list-style-type: none"> - Bookable charge stations for HDVs - Available time slots. -
Functional UCs	tbd
Actors	CPO, MSP, NSP, Data Collectors, TO
Flow	<ul style="list-style-type: none"> - CPO send info about location and EVSE and charge parking bay to MSP/NSP/DC
Remarks	<ul style="list-style-type: none"> • To prevent unnecessary data load it would be logic to treat this as dynamic data and only share it when selected/requested.

[BUC 1.2.2] As a CPO, I want to offer MSP and TO time slots available for booking at charging locations and charge points.

Objective	Similar to BUC 1.2.1 The MSP receives up to date information about available timeslots for specific charge stations, from the CPO
Description	The NSP, MSP and Data Collectors want to know the available time slots when their users can charge their HDVs. This information is coming from the CPO.
Pre-conditions	-
Functional UCs	
Actors	
Flow	
Remarks	



[BUC 1.2.3] As a CPO, I want to update time slots offered to TO and MSP for booking at charging locations and charge points when availability changes (for any reason).

Objective	The MSP receives updates about available timeslots for specific charge stations, from the CPO that can be shared with their users/TO's.
Description	The MSP, NSP and Data Collectors want to get updates of the available time slots when their users can charge their HDVs. This information is coming from the CPO.
Pre-conditions	CPO has all location and station information available (static and dynamic) and know which charges stations can be booked at what times with the following info: <ul style="list-style-type: none">- Bookable charge stations for HDVs- Available time slots.
Functional UCs	tbd
Actors	CPO, MSP, NSP, Data Collectors, TO
Flow	<ul style="list-style-type: none">- MSP, NSP, DC subscribe to certain charge stations to receive updates- CPO send updates of additional booked slots (or about reduced number of available slots) of charging stations to MSP/NSP/DC
Remarks	<ul style="list-style-type: none">• To prevent unnecessary data load it would be logic to treat this as dynamic data and only share it when selected/requested. Updates can be done via subscription.



2. UCs about Managing the booking of a charge station and charge slot

[BUC 2.1] As a TO I request to the CPO with my MSP UID, a booking of time slot at charging location of a specific charge point and/or specific connector type and/or specific power (eg. min /max power delivered), so that I know that I will be able to get the required energy when needed. This, as far as a guaranteed min power is possible/can be submitted.

Objective	The TO will have a booking of a charge station in line with the requirements TO at a time slot. The requirements should also include on which side the inlet at the vehicle is located (can also be done via a profile of the vehicle in the app)
Description	The TO create a booking of a charge, with the result that a charge station or one of a group of charge stations is reserved for that TO at a certain moment (day and time) and for a certain period.
Pre-conditions	<ul style="list-style-type: none"> - CPO is connected to the MSP or offers MSP services for the TO directly - Bookable charge stations must be known - Available time slots must be known
Functional UCs	tbd
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> 1. TO select a location on an app or mobile website from the CPO (this is an MSP role service) <ol style="list-style-type: none"> 1 This can be done based on entered selection criteria before the selection. 2 Or first a location can be chosen and then the selection criteria are entered 3 This includes required time slot (day and time) 4 The requirements should also include on which side the inlet at the vehicle is located (can also be done via a profile of the vehicle in the app) 2. CPO share/show available charge stations at that time slot 3. If no corresponding time slot are available, the closest available time slots are shown 4. TO request with his MSP UID to make a reservation at a charge station or at a group of the charge stations 5. The CPO block the time slot for the requested MSP UID for a specific charge station AND charge parking bay 6. Or the CPO block makes sure that at the requested time slot at least one charge station with the specifications is available for that MSP UID. Taking into account the charge parking bay, as that might impact on which side the charger is located compared to the vehicle. 7. The CPO creates and sent a Booking ID via the MSP to the TO



Remarks	<ul style="list-style-type: none"> • It is important to also allocate and include the related charge parking bay(s), depending on the design of the CPO. • It can still be discussed if a specific charge station is reserved or one of a group of charge stations. • For the TO the exact charge station is not relevant during booking, only at arrival at the location
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[BUC 2.2] As an MSP, I want request booking of time slots for a location or charge point for any or specific MSP users

Objective	A booking done by the MSP with the CPO at one or one of a group of charge stations for specific MSP users
Description	The MSP create a booking of a charge for one of his users (TO), with the result that a charge station or one of a group of charge stations is reserved for that user at a certain moment (day and time) and for a certain period.
Pre-conditions	<ul style="list-style-type: none"> - CPO is connected to the MSP or offers MSP services for the TO directly - Bookable charge stations must be known by the MSP via direct link to the locations from the CPO - Available time slots must be known by the MSP via direct link to the locations from the CPO -
Functional UCs	Tbd
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> 1. TO select a location on an app or mobile website from the MSP 2. This can be done based on entered selection criteria before the selection. 3. Or first a location can be chosen and then the selection criteria are entered 4. This includes required time slot (day and time) 2. MSP share/show available charge stations at that time slot 3. If no corresponding time slot are available, the MSP will do an a check with the CPO to share closest available time slots 4. TO request to the MSP with his MSP UID to make a reservation at a charge station or at a group of the charge stations 5. The CPO block the time slot for the requested MSP UID for a specific charge station 6. Or the CPO block makes sure that at the requested time slot at least one charge station with the specifications is available for that MSP UID.



	<ol style="list-style-type: none"> 7. The CPO creates and sent a booking reference ID via the MSP to the TO 8. The MSP can invoice the TO for supporting the booking.
Remarks	<ul style="list-style-type: none"> • It can still be discussed if a specific charge station is reserved or one of a group of charge stations. • For the TO the exact charge station is not relevant during booking, only at arrival at the location • The reservation must be registered at the MSP to ensure that a certain MSP-TO booking fee can be invoiced either at moment of reservation or e.g. via subscription monthly kind of fee.

[BUC 2.3] As a TO I want to manage my booking using my MSP UID.

[BUC 2.3.1] As a TO I want to change / reschedule booked time slot

Objective	A booked time slot done by the TO directly at CPO (as MSP service from the CPO) is changed on request of the TO
Description	The TO does a request for change for a booked charging station done directly at the CPO and get it confirmed
Pre-conditions	<ul style="list-style-type: none"> • Situation [BUC 2.1] As a TO I request to the CPO with my MSP UID, a booking of time slot at charging location of a specific charge point... • A booking reference search system is available at the CPO.
Functional UCs	Tbd
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> 1. TO enters his booking ref ID at CPO system – (=internal CPO service) 2. CPO retrieves booking details (=internal CPO service) 3. The CPO shares other available booking options to the TO 4. The TO creates a new booking like in [BUC 2.1] 5. Existing booking is automatically be cancelled at CPO system when new booking is made. (=internal CPO service) 6. CPO creates and shares new booking reference ID with TO via the MSP (only the MSP knows the contact details of the TO)
Remarks	<ul style="list-style-type: none"> •

[BUC 2.3.2] As a TO I want to change the booked charger or connector type or requested power (eg. min / max power delivered)



Objective	A booked charger done by the TO directly at CPO (as MSP service from the CPO) is changed on request of the TO, because of changed requirements.
Description	
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	<ul style="list-style-type: none"> • Same situation as [BUC 2.3.1] only with reasons/requirements for the change

[BUC 2.3.3] As a TO I want to cancel the total booking

Objective	A booking done by the TO at the CPO is cancelled by the TO.
Description	
Pre-conditions	<ul style="list-style-type: none"> • A done booking by TO at the CPO • A reference ID is available
Functional UCs	
Actors	
Flow	
Remarks	<ul style="list-style-type: none"> • Similar situation as [BUC 2.3.1] without a new booking is done, but only the cancellation • The CPO might want to invoice cost for this to the TO • This should be done via CDR to the MSP, as the MSP is the only one with contact details of the TO.

[BUC 2.3.4] As a TO I want to be able to manage my booking and replace it with another location or another charge point of the same CPO (as a TO i want to cancel an existing booking and replace it by a new one)

Objective	A booking done by the TO at a different charge point or location compared to the initial booking at the CPO.
Description	
Pre-conditions	<ul style="list-style-type: none"> • A done booking by TO at the CPO



	<ul style="list-style-type: none"> • A reference ID is available
Functional UCs	
Actors	
Flow	
Remarks	<ul style="list-style-type: none"> • Similar situation as [BUC 2.3.1] with either a cancellation and after that a new booking. • The CPO might want to invoice cost for this to the TO • This should be done via CDR to the MSP, as the MSP is the only one with contact details of the TO.

[BUC 2.4] As an MSP, I want to request modification or cancellation of an active booking.

Objective	A booked time slot done by the MSP for a specific TO at CPO is changed.
Description	The MSP does a request for change on behalf of a TO (= customer from the MSP) for a booked charging station at the CPO and get it confirmed.
Pre-conditions	<ul style="list-style-type: none"> • Situation [BUC 2.2] As a MSP I want to request booking of time slots for a location or charge point for any or specific MSP users • A booking reference search system is available at the CPO.
Functional UCs	Tbd
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> 1. TO enters his booking ref ID at CPO system – (=internal CPO service) 2. CPO retrieves booking details (=internal CPO service) 3. The CPO shares other available booking options to the TO 4. The TO creates a new booking like in [BUC 2.1] 5. Existing booking is automatically be cancelled at CPO system when new booking is made. (=internal CPO service) 6. CPO creates and shares new booking reference ID with TO via the MSP (only the MSP knows the contact details of the TO)
Remarks	<p>The modification can be done for:</p> <ul style="list-style-type: none"> - Timeslot - Truck/HDV - Location / EVSE



[BUC 2.5] As a TO I want to receive information when booked charging station is not working correctly, prior to arriving and during a session.

Objective	The TO is informed about malfunctioning of a booked charger before arrival at charge location and when something happens with the charger during the charge session.
Description	The CPO shares information to the end user (TO) about malfunctioning of booked charger.
Pre-conditions	<ul style="list-style-type: none"> • [BUC 2.1] Charger is booked by certain TO with his MSP user ID • Monitoring of CPO on performance of booked stations is required.
Functional UCs	Tbd
Actors	CPO, MSP, TO, NSP
Flow	<ol style="list-style-type: none"> 1. CPO notice that a booked charger or charger in use is malfunctioning (=internal CPO system). 2. The CPO informs the TO via the MSP i.e. sent a message to the MSP for a certain TO <ol style="list-style-type: none"> a. It is up to the internal CPO system when this is done 3. MSP receives the information and shares it directly with the TO. 4. The information is also shared with NSPs via the location information that the charger is malfunctioning. 5. The CPO can offer alternative booking/charging possibilities. That is up to the internal CPO system and offered services.
Remarks	

[BUC 2.6] As a CPO, I want to confirm creation to the TO, modification or cancellation of an active booking based on booking requests

Objective	Confirmation of the creation, change or cancellation of the booking at TO
Description	The CPO shares information to the end user (TO) about status creation or status change of the booking.
Pre-conditions	<ul style="list-style-type: none"> • [BUC 2.1] Charger is booked by certain TO with his MSP user ID • Or [BUC 2.2] Charger is booked by an MSP for a specific TO
Functional UCs	Tbd



Actors	CPO, MSP, TO, NSP
Flow	<ol style="list-style-type: none"> 1. Booking is made by MSP or TO at the CPO <ol style="list-style-type: none"> a. Confirmation of booking is sent to the TO via the MSP i.e. sent a message to the MSP for a certain TO 2. Or with changed or cancelled booking <ol style="list-style-type: none"> a. Booking ID is requested by CPO to the TO (via the MSP) b. Modification (i.e. change or cancellation) is made by the TO c. CPO confirms the modification to the TO
Remarks	

[BUC 2.7] As a CPO: I want to modify and cancel active bookings because of unexpected maintenance / outages and inform TO and the MSP

Objective	Information at TO and MSP about a by CPO modified or changed booking
Description	The CPO changes or cancels on own initiative a booking and inform the MSP and TO
Pre-conditions	<ul style="list-style-type: none"> • [BUC 2.1] Charger is booked by certain TO with his MSP user ID • Or [BUC 2.2] Charger is booked by an MSP for a specific TO
Functional UCs	Tbd
Actors	CPO, MSP, TO, NSP
Flow	See [BUC 2.6]
Remarks	<p>This is an internal CPO and CPMS process with a trigger to sent a message to the MSP or direct to the TO, if the CPO has his contact details.</p> <p>Similar process as [BUC 2.6]</p>

[BUC 2.8] As a CPO I want to send alternative charging booking suggestions to MSP and/or TO, if there is an unexpected maintenance/outage.

Objective	To receives alternative options when based on BUC 2.7, there are issues with the booked charging station.
Description	The CPO shares list of free charging stations available within the timeframe of the booked charging station to the end user (TO). This can be charging stations available from x minutes before the original booking until x minutes after the original booking.
Pre-conditions	<ul style="list-style-type: none"> • [BUC 2.1] Charger is booked by certain TO with his MSP user ID



	<ul style="list-style-type: none"> • Or [BUC 2.2] Charger is booked by an MSP for a specific TO • [BUC 2.7] happened
Functional UCs	Tbd
Actors	CPO, MSP, TO, NSP
Flow	<ol style="list-style-type: none"> 1. Booking is made by MSP or TO at the CPO 2. Charge station not available after the booking (internal CPO/CPMS) 3. [BUC 2.7] TO is informed 4. Overview of available charging stations at same or close by locations are shared that are available x minutes before until x minutes after original booking <ol style="list-style-type: none"> a. Internal CPO/CPMS decides on definition of “close by”. End User (TO) might be able to change this based on his/her requirements. Similar as filters for finding available charging stations [BUC 1.1] and [BUC 1.2] b. Internal CPO/CPMS decides on definition of “x minute before and after original booking”. End User (TO) might be able to change this based on his/her requirements. Similar as filters for finding available charging stations [BUC 1.1] and [BUC 1.2]
Remarks	This is similar to the process of finding a bookable and on the right moment available charging station, only triggered from the CPO side as result of issues with original booked charging station.

[BUC 2.9] As a CPO I want to offer modification / cancellation to MSP and TO but not longer than > Xh in advance – or an optional modification/cancellation fee need to be paid

Objective	A changed or cancelled booked time slot done by the MSP for a specific TO at CPO, xh before the original booking
Description	Similar as “[BUC 2.4] As an MSP, I want to request modification or cancellation of an active booking”, with condition it is only allowed to cancel or modify free or with a cost at the latest x hours before original booking.
Pre-conditions	
Functional UCs	
Actors	CPO, MSP, TO
Flow	<ul style="list-style-type: none"> • Similar as [BUC 2.4]



	<ul style="list-style-type: none"> • If change is within by CPO set hours, a modification fee can be invoiced by the CPO to the TO via the MSP. • Before confirmation from the TO, the different tariff and/or delivered/available power will be shared with the TO. So that they can make a choice to do it or not.
Remarks	The modification can be done for: <ul style="list-style-type: none"> - Timeslot - Truck/HDV - Location/EVSE

[BUC 2.10] As a MSP I want to send a reminder to TO about an upcoming active booking

Objective	Reminder received by TO of upcoming booking (charge event)
Description	MSP send information/reminder to TO about a booking.
Pre-conditions	<ul style="list-style-type: none"> • [BUC 2.1] Charger is booked by certain TO with his MSP user ID • Or [BUC 2.2] Charger is booked by an MSP for a specific TO • TO via MSP tools requested receiving reminders <ul style="list-style-type: none"> - X hours before the charging? - Or only yes/no and leave it up to the CPO when it is sent?
Functional UCs	Tbd
Actors	CPO, MSP, TO
Flow	1. MSP sent reminder about booking to TO (internal MSP system)
Remarks	

[BUC 2.11] As a TO I want to be informed by MSP with info from the CPO about the status of my active booked charging sessions and if it has been expired (charged successful / no show).

Objective	Booking and charging status info at TO via MSP tools
Description	The MSP checks the status of a booking at CPO system for a TO
Pre-conditions	<ul style="list-style-type: none"> • [BUC 2.1] Charger is booked by certain TO with his MSP user ID • Or [BUC 2.2] Charger is booked by an MSP for a specific TO



	<ul style="list-style-type: none">• TO via MSP tools requested receiving info from the CPO about the status of the charging session
Functional UCs	Tbd
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none">1. MSP has booking ID from their TO,<ol style="list-style-type: none">a. either stored in own systemsb. or entered by the TO via the MSP tools (app/website)2. MSP send request to CPO with booking ID(s) to retrieve booking and charging info3. If charging: CPO responds with charging details
Remarks	<ul style="list-style-type: none">• Requires setting messages between MSP and CPO about the required data• Session info can standard be shared via Sessions module - should contain a link with the booking ID.

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3. UCs about Managing the charging session

[BUC 3.1] As a CPO, I want to validate the correct reservation holder is attempting to start the charge, whatever the authentication mode is (15118 PnC; RFID, etc). *(Note: This is a local check at the station and via the station with the CPO system, where no roaming (OCPI) protocol is required.)*

Objective	Right user is attempting to charge
Description	The CPO wants to do a check, e.g. via booking ref ID that the right user is attempting to charge.
Pre-conditions	<ul style="list-style-type: none">• [BUC 2.1] Charger is booked by certain TO with his MSP user ID• Or [BUC 2.2] Charger is booked by an MSP for a specific TO
Functional UCs	Tbd
Actors	CPO, TO
Flow	<ol style="list-style-type: none">1. The TO is asked by the CPO to enter a booking ID at pinpad at the station2. The CPO verifies the ID and relieves the charge station
Remarks	This requires additional functionalities at the charge station.

[BUC 3.2] As an MSP, I want to authorize users to perform charging at a charge point or location. *(Note: This user story is covered by existing OCPI functionality)*

Objective	Charging authorized driver via the MSP-EV driver ID.
Description	Normal authorization via MSP app or physical token
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	

[BUC 3.3] As a Transport Operator, I want to initiate, perform, and end charging at a charge point.

[BUC 3.3.1] As a Transport Operator, I want to initiate, perform, and end charging at a charge point within my booked time. *(Note: This user story is similar as [BUC 3.2] and covered by existing OCPI functionality – internal CPO system check if the token is allowed that time)*



Objective	Charging authorized driver via the MSP-EV driver ID within booked time slot
Description	Normal authorization via MSP app or physical token
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	It is up to the CPO system to check if the token connected to a booking ID is allowed for that time. If not, token is refused, if OK, token is accepted – that is internal CPO system.

[BUC 3.3.2] As a Transport Operator, I want to initiate charging at a charge point earlier than my booked time if possible. *(Note: This user story is similar as [BUC 3.2] and covered by existing OCPI functionality – internal CPO system check if the token is allowed that time)*

Objective	Charging authorized driver via the MSP-EV driver ID earlier then booked time slot
Description	Normal authorization via MSP app or physical token
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	It is up to the CPO system to check this. If the charge station is available and can be used without reservation, the CPO system can decide to accept it. If the charge station can only be used with reservations, the CPO system can check if there is a booking ID connected to this TO token and decide if charging can already start. This is all internal CPO systems to deal with.

[BUC 3.3.3] As a Transport Operator, I want to end charging at a charge point after my booked time (when charging is finished outside booked period). *(Note: This user story is covered by existing OCPI functionality to end a charging session)*

Objective	Ended charging session outside the booked period
Description	Normal ended charging session via MSP app or physical token



Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	It is up to the internal CPO system to either stop the session at end booked time via CPO system or to allow it to continue charging until ended by user.

[BUC 3.4] As an MSP, I want to provide information to the TO about the possibility to initiate charging at a booked charge point. *(Note: except for standard charge station related info e.g. type of plug, type of authentication, etc, which is part of OCPI, other information can be shared between CPO and MSP in any other way. No specific OCPI functionality needed for this BUC)*

Objective	TO informed how to start charging at a charging location.
Description	
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	MSP should get info in any way from the CPO how charging sessions can start. Ways to use it like PnC or via app or physical token, etc is standard shared via OCPI. Other info can be shared in any other way.

[BUC 3.5] As an MSP, I want to provide information to TO about the need to end charging at a booked charge point e.g x minutes before time slot is ending or x minutes before vehicle reached a set SoC. *(Note: Information should be available during the session, it is up to the MSP to inform their client. This BUC is similar to BUC 2.11)*

Objective	TO informed about charging status of an on going session, via the MSP
Description	The MSP receives info from the CPO and forwards this to the TO about the status of charging which may include info about booking slots. SoC info is retrieved from the CPO, info like x minutes before a time slot is ending, might be retrieved and shared via the own MSP system. This is directly related to [BUC 3.11]
Pre-conditions	<ul style="list-style-type: none"> Booked charging station



	<ul style="list-style-type: none"> Started and active charging session
Functional UCs	
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> CPO shares information with the MSP based on settings in the CPO system (see also comments in the note above) The MSP shares this via own MSP-EV driver system to the TO
Remarks	SoC info is part of Smart Charging and is independent from a specific vehicle type. It can only be shared if the station shares this with the CPO system.

[BUC 3.6] As a CPO, I want to end charging at a booked charge point when charging is no longer allowed. (Note: this is internal CPO system to stop a charging session from CPO side at any certain moment for any reason)

Objective	By CPO ended charging session
Description	
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	

[BUC 3.7] As a CPO i want to get notified when a TO/driver stops the charging session ahead of time (so that the connector is back available for potential waiters) - *(This can be developed and done by internal CPMS system from CPO based on signal of Stop Transaction.)*

Objective	CPO is notified that a charging session of a TO is stopped.
Description	
Pre-conditions	
Functional UCs	
Actors	
Flow	
Remarks	



[BUC 3.8] As CPO I want to share charge session progress and updates with TO e.g. how much time left, SoC, charging power, etc – *(This can partially already be done via the MSP using session information. This BUC is similar to BUC 3.5 and 2.11)*

Objective	TO is notified about status during a charging session
Description	CPO shares information about the actual on going charging session.
Pre-conditions	<ul style="list-style-type: none"> Started charging session
Functional UCs	
Actors	
Flow	
Remarks	Need to be checked with Smart Charging UCs and functionalities, as this is not directly unique for HDV charging and current missing information in sessions, is likely to be shared already via Smart Charging updates and modules

[BUC 3.9] As a CPO I want to reject attempts to start a (remote) charge for a reserved charger with informed error messaging

Objective	Refused charging session, with reason
Description	CPO rejects start of a charging and shares reason e.g. that it is booked by someone else.
Pre-conditions	<ul style="list-style-type: none"> Booked charging session
Functional UCs	
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> TO want to start charging session via MSP app or via physical token or via PnC (15118). CPO checks internal and refuse the authentication CPO shares reason via right error message
Remarks	Requires probably only additional error messages about booking (e.g. "booked by other user", etc) during authentication process.

[BUC 3.10] As a TO/Driver, I want to report to the CPO a charger is blocked/broken and recover reservation fee

Objective	Informed CPO that a booked charger cannot be used and reservation fee paid back by CPO to TO.
Description	TO has a way to inform the CPO that charging cannot be done and that reservation fee must be recovered.
Pre-conditions	<ul style="list-style-type: none"> Booked charging session CPO offers a direct way to be informed



	<ul style="list-style-type: none"> And or, the MSP offers a way in the app to inform the CPO based on input from the TO – this would require new data exchange functionality between MSP and CPO.
Functional UCs	
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> The CPO get direct info via phone or CPO website or app that charge station cannot be used, in combination with the booking ID. Or the info is coming via the MSP app incl booking ID The booking is cancelled A negative CDR is created by the CPO with the booking fee to the MSP who can forward it to the TO.
Remarks	<p>If the info is coming direct at the CPO, this is internal CPO system offering.</p> <p>If the info is coming from the MSP app, it requires modifications in the messaging between MSP and CPO.</p>

[BUC 3.11] As a CPO you want to get in touch with the Driver during the charging session

Objective	CPO in touch with the driver during a charge session.
Description	<p>As CPO you want a 'direct' communication possibilities with the driver during a charge session.</p> <p>This is directly related to [BUC 3.5]</p>
Pre-conditions	<ul style="list-style-type: none"> Started charging session
Functional UCs	
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none"> CPO sent a message for a certain UID that is currently charging to the MSP The MSP can forward this to the driver, knowing the contact details.
Remarks	<p>As CPO you do not have direct contact details from the driver. This is initially done because of privacy reasons and it is the customer of the MSP.</p> <p>In case of a booked charge station, it might be possible that next to the booking_ID also driver contact details are shared, taking into account GDPR regulations and agreement MSP.</p>

[BUC 3.12] As a CPO: I want to authorise trucks by licence plaid or code to enter the charging location

Objective	Only authorized vehicles at a charge location.
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Description	As CPO you want only vehicles and drivers that are authorized at your charging location – this applies to closed charging locations.
Pre-conditions	<ul style="list-style-type: none">• Booked charging station
Functional UCs	
Actors	CPO, MSP, TO
Flow	<ol style="list-style-type: none">3. Together with the booking a license plate is requested4. Or when booking is made, a code is submitted for access next to the booking_ID.5. When driver enters the location, either the numberplate is automatic checked via ANPR (Automatic Number Plate Recognition) or by entering it via device near the location.6. In case of a code, the code is requested at the location to enter it.
Remarks	

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4. UCs about Managing the payment and settlement*

** BUCs are only described if it is different from existing functionalities*

[BUC 4.1] As a Transport Operator, I want to know my consumption and to pay for booked time slots and charging *(Note: this is standard CDR/invoice functionality)*

[BUC 4.2] As a CPO I want to charge a TO / MSP a now show penalty in case an active booking is not used (optional) *(Note: this is standard CDR/invoice functionality with the addition of a now show tariff component)*

[BUC 4.3] As a CPO I want to charge a TO / MSP an overtime penalty if the HDV is still plugged even though the reservation no longer allows it to be. *(Note: This can be similar to rotation tariff. Is standard CDR/invoice functionality with the addition of an overtime penalty tariff component)*

[BUC 4.4] As a CPO, I want to provide price information of the charging session to the MSP and get payment for booked time slots and charging *(Note: this is standard CDR invoicing functionality)*

[BUC 4.5] As an MSP, I want to provide price information of the charging session and get payment for booked time slots and charging from Transport Operator. *(Note: this is standard CDR invoicing functionality)*

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