OCPI functionalities ECISS and Reference implementation

ECISS DELIVERABLE 2.1 & 2.2

ECISS

From electric vehicle to smart society

a TKI Urban Energy project

ECISS: E-MOBILITY COMMUNICATION & INFORMATION SYSTEM STRUCTURE
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Contents

Introduction

This Work Package contains the development of new functionalities for OCPI. This by drawing up Use Cases, requirements, specifications and a reference implementation. The aim of this work package is to improve the national and international connection to the market requirements and to accelerate the roll-out nationally and internationally, to increase the services to EV drivers in an interoperable manner. These functional requirements will include information objects defined in other protocols (such as OCPP, ISO 15118, IEC 61851) as much as possible, so that they can also be communicated about the OCPI protocol. This work package has a relation with work package 5 of the ECISS project. This report describes the outcome of two workshops. Each workshop follows the agenda below:

- Introduction and basic picture of systems (less focus on roles)
- Use Case 1
- Use Case 2
- Use Case 3
- Use Case 4
- Review, discuss eMobility domain
- Review, discuss electricity/aggregator domain
- Conclusions, action points, next steps

Use Case descriptions

The use cases are and described in the table below:

UC1	**Smart Charging with ESP of User at Home**
User accepts a flexibility service, flexibility of the charging is used by an ESP (e.g. aggregator) on an energy market. The user will be rewarded for this, UC1 describes an at home charging situation.	
UC2	**Smart Charging with ESP of the CSO**
In case the CSO (or his CS customer) has an own ESP. Then the CSO will communicate with the ESP of the CSO (and not of the EV User!)	
UC3	**Other Smart Charging use cases**
This section describes smart charging use cases other than UC1 and UC2. This includes the use of renewables.	
UC4	**Transparent pricing – Tariff Communication**
Simply charging at the Pay-As-You-Go price of the CSO. This requires B2B price of CSO to be communicated to MSP. The MSP has his own communication channel with the customer (optionally made visible if feasible at CS).	
UC5	**Other use cases**
Here a number of use cases are described that relate to the NAP and NSP entities within the OCPI protocol. The aim is to make the correct and up-to-date information available to the end user.	

1. UC1 Smart Charging with ESP of User at Home

No.	Type	Description
1	Kind of Use case	System Use Case
2	Use case ID	SmartCharging01
3	Objectives	Control the flow of energy to the vehicle via Smart Charging Profiles based on Energy Market parameters (eg price, availability, etc)
3.1	Use case context	The location owner of a charging station wants to control the total cost of ownership. One of the aspects is the costs of energy that is needed to charge the vehicle. Especially when a lot of charging stations are involved, it is very attractive to be active on the Energy Market and have control on the way the energy flows to the battery of the car. Mostly the location owners will not be themselves active on the energy market, but have it outsourced to an Energy Service Provider (ESP) like an Energy Broker. When a location owners mandates an ESP to control the energy of a charging station, he has to inform the CSO about this. To make it possible that an ESP can control, it needs to have a connection with the CSO. SmartCharging control by third parties (like the ESP) can only be done on running charging sessions. To make this possible, this party needs to be informed that a charging session has started. As a response they can than sent in their requested charging profiles. For a MSP this is organized, because they will get the session automatically when one of their tokens is used to start a session. For an ESP special action need to be taken. They are not aware of charging sessions that are started on the charging stations they have to control, and therefor need to be informed by the CSO.
4	Description	1) User starts a charging session at a charging station that is under control of an ESP with his token provided by the MSP (UC3 step 1). 2) The MSP will be notified via a push-message of a session by the CSO (UC3 step 4) 3) The ESP, that is registered by the Location Owner at the Charging Station, will be notified via a push-message of a session by the CSO (UC3 step 10) 4) The ESP calculates, based on his own information, a charging profile for the charging session 5) The charging profile will be sent to the CSO as a push-message with a request to activate this on the charging session (UC3 step 11) 6) The CSO will retrieve the request and validate it against their rules. 7) When the validation is okay, the request will be forwarded to the charging station, and the CSO will wait for the feedback. (UC3 step 12) 8) The result of the feedback will be sent, via a patch-message, to the ESP. (which step?)

		9) The MSP will be informed about the fact that the charging session is under control of an ESP and that Smart Charging has been activated (could be done earlier, or modify step spreadsheet) 10) When the validation is not okay, the request will be declined with a reason why.
5	Prerequisites	•
6	Requirements	• A new role needs to be introduced in OCPI, to make a difference between MSP and ESP. In most cases these will be two different parties that are involved in the charging session and need to be addressed separately. • It must be possible for a location owner and/or CSO to recognize that a party is involved that is controlling the energy other that the MSP. • The EV driver needs to be informed that smart charging has been activated by the location owner via the MSP • The EV driver should have a possibility to stop the smart charging, because he needs full power to fill up his battery.
7	End Condition	•

No.	Type	Description
1	Kind of Use case	System Use Case
2	Use case ID	SmartCharging02
3	Objectives	The EV driver can override any Smart Charging profile that has been activated on his charging session
3.1	Use case context	Activation of a SmartCharging profile on a charging session can mean that it will take longer than normal to charge your vehicle. In cases when this happens at home or at the office this could not be an issue, because the time connected to the charging station is longer than the time needed to charge the vehicle. But sometimes the EV driver has a need that he wants his vehicle will be charged at full power, because he his limited time, and is willing to pay for this. Therefor he needs to be informed about the fact that SmartCharging has been activated and given the option to override.
4	Description	1) User starts a charging session at a charging station that is under control of an ESP with his token provided by the MSP. 2) The EV driver gets informed that a SmartCharging profile has been activated and the expected time that the battery is fully charged is presented to him 3) An option is presented to him, that he can override this SmartCharging action and ask the MSP to set the profile to full power. 4) The MSP receives this request from the EV-driver and will sent the SmartCharging request via a push-message to the CSO 5) The CSO will retrieve the request and validate it against their rules. 6) When the validation is okay, the current active charging profile will be ended by the CSO. 7) The request from the MSP will be forwarded to the charging station, and the CSO will wait for the feedback. 8) The result of the feedback will be sent, via a patch-message, to the MSP. 9) The ESP will be informed about the fact that the charging session has been overridden by the MSP 10) When the validation is not okay, the request will be declined with a reason why and the activated charging profile will be active
5	Prerequisites	• When a SmartCharging is activated by an ESP, the MSP and EV driver will be informed about this.
6	Requirements	• The EV driver should have a possibility to stop the smart charging, because he needs full power to fill up his battery. • The ESP needs to be informed about the fact that the EV driver has overridden his request via the MSP, and that he is now in control. • Any extra costs that are possible involved will be handled by the MSP
7	End Condition	•

An UML overview of the concept OCPI Smart Charging according to Jedlix can be found in Annex 2.

2. UC2 Smart Charging with ESP of the CSO

No.	Type	Description
1	Kind of Use case	System UC
2	Use case name	CSMS-EMS information exchange
3	Objectives	This SUC describes the information exchange between CSMS and EMS
3.1	Use case context	EMS is responsible of the management of the energy behind a grid connection point (e.g. in a building or in a home.) CSMS is responsible for management of one or many Charging Stations installed behind a grid connection point (e.g. in a building or in a home.). EMS optimises energy and power allocation between Resources (load, storage and production systems) behind a grid connection point. One of the resources is the CSMS. EMS provides energy and power budget to CSMS. CSMS optimises e-mobility energy transfers based on EMS budget, e-mobility needs and contracts terms.
4	Description	1. EMS and CSMS maintain an event loop monitoring changes in energy or power conditions. 2. If an energy or power condition changes occurs at CSMS level (e.g. a new EV arrives, an EV leaves…) a. CSMS calculates the impact in the current budget and send a request for update to EMS. b. After reception of the updated budget the CSMS informs the affected CSs of the new power allocated for each EVSE impacted. 3. If an energy or power condition change occurs at EMS level (e.g. a more or less power is available, curtailment message received from DSO…) a. EMS sends an updated budget to CSMS b. After reception of the updated budget the CSMS informs the affected CSs of the power allocated for each EVSE impacted. Note: the CSMS may have received instructions from the market flexibility operators. In that case the CSMS will maintain the power budget allocated from the EMS, whatever the flexibility are, in order for the grid to get the benefit of the flexibility.
5	Prerequisites	- CSMS and EMS have a trusted and running communication established
6	Requirements	1. CSMS shall transfer to EMS any changes in e-mobility energy or power local condition that are likely to impact the budget allocated to e-mobility. 2. CSMS changes on aggregated energy or power budget estimated by CSMS shall be expressed in power, energy and time units allowing EMS to calculate the new budget. 3. CSMS shall apply the energy and power budget received from EMS. Note 1 thresholds may apply to avoid small variations flooding CSMS-EMS with frequent messages.

7	End conditions	- Error in communication between CSMS and EMS

3. UC3 Other Smart Charging use cases

In this chapter TNO gives three possible other smart charging use cases. One is EV Smart Charging at home with a preference of locally generated PV energy. A second one is EV Smart Charging for a local pool of EVSEs with a local EMS (Energy Management System). A third case is EV Smart Charging with a Flexibility Aggregator that optimizes, also based on electricity markets, and makes the best possible charge profile.

No.	Type	Description
1	Kind of Use case	System Use Case
2	Use case ID	ECISS-TNO-SC-1
3	Objectives	EV Smart Charging at home also on local PV energy with CEM
3.1	Use case context	This use case covers EV Smart Charging at home with a preference of locally generated energy, often from PV. The reason is that if more energy is generated locally than consumed it flows back into the grid. In some countries already now, and in The Netherlands in the near future, the prosumer will get paid less for this energy then it needs to pay when it consumes from the grid. Besides this financial incentive also prosumers like to use PV energy from CO2 footprint point of view.
4	Description	11) EV driver arrives with his EV at own EVSE at home 12) EV driver connects car to EVSE (no MSP card needed) 13) EV driver makes clear to HEMS (Home Energy Management System) or CEM (Customer Energy Manager) via smart phone app what it charging needs are: mainly ToD (Time of Departure, and or next trip distance) and charge preference on home surplus (like from the PV panels on the roof) 14) CEM receives further information like SoC of the vehicle (e.g. via car OEM) 15) CEM will based on this information and own PV forecast (calculated in for example CEM) and other domestic electricity use (smart meter) make a best possible EV charge profile: it also takes into account if needed the contracted home grid capacity 16) CEM sends charge profile to the home EVSE 17) EVSE executes this profile and EV starts charging 18) Likely no specific billings/CDRs (Charge Detail Records) are necessary 19) Likely reschedules needed are needed when domestic electricity use or PV forecast/actuals are changing
5	Prerequisites	• No specific ones.
6	Requirements	• The EV driver should have a possibility to override the smart charging, e.g. because he needs full power to fill up his EV battery. • A HEMS and CEM needs to be available and have access to some information sources.
7	End Condition	• Battery of EV filled to users need level.

No.	Type	Description
1	Kind of Use case	System Use Case
2	Use case ID	ECISS-TNO-SC-2
3	Objectives	EV Smart Charging for a local pool of EVSEs with EMS
3.1	Use case context	This use case covers EV Smart Charging for a local pool of EVSEs with an EMS (Energy Management System). The main goal is not to overload the grid connection and as such do not have to pay for a higher rated grid connection. Further is offers also options for the EMS to exploit some of the flexibility on energy markets (or locally generated energy) depending on the contract with the energy supplier and agreed tariffs.
4	Description	1) EV drivers arrive at EVSEs with their EVs 2) EV driver connects to EVSE, default uses MSP card etc. 3) CPO verifies card at MSP or at roaming hub 4) EV driver makes clear to MSP (via smart phone app, or pre-settings) what its preferences are: fast, smart, CO2 neutral and of course ToD (Time of Departure) and or next trip distance. 5) The local EMS (Energy Management System), likely operated by an ESP (Energy Service Provider), receives (channels to be defined) information like: charge power possibilities (e.g. via CPO) SoC of the vehicles (e.g. via OEM) and user preferences (e.g. via MSP) 6) EMS will based on this information (and the electricity market) make a best possible charge profile that prevents overloading the contracted grid capacity (smart meter reading used). local PV can be present and being used in some cases also a local battery can be used to make use of energy market and prevent overloads 7) EMS sends charge profiles to EVSEs 8) EVSEs execute these profiles and EVs starts/are charging 9) Likely no specific billings/CDRs are necessary 10) Likely reschedules are needed when electricity use or PV forecast/actuals are changing, or new EVs arrive or leave
5	Prerequisites	• User needs to agree with smart charging.
6	Requirements	• The EV driver should have a possibility to override the smart charging, because he needs full power to fill up his EV battery. • An EMS needs to be available and have access to some information sources.
7	End Condition	• Battery of EV filled to users need level.

No.	Type	Description
1	Kind of Use case	System Use Case
2	Use case ID	ECISS-TNO-SC-3
3	Objectives	EV Smart Charging with a Flexibility Aggregator
3.1	Use case context	This use case covers EV Smart Charging of an EV by means of a Flexibility Aggregator. The main goal is to exploit the flexibility on various energy markets to get the best offer (or CO2 footprint). Optionally the grid connection capacity can or needs to be taken into account.
4	Description	1) EV driver arrives at (a publicly accessible) EVSE with its EV 2) EV driver connects car, uses MSP card 3) CPO verifies card at MSP or at roaming hub 4) EV driver makes clear to MSP via smart phone app what its preferences are (or uses pre-sets): fast, smart, CO2 neutral and of course ToD (Time of Departure, and or next trip distance) 5) Aggregator (special type of ESP), but still an ESP (Energy Service Provider), receives (communication channels to be defined) information like: charge power possibilities (e.g. via CPO) SoC of the vehicles (e.g. via OEM) and user preferences (e.g. via MSP) 6) Aggregator will based on this information and the electricity markets make a best possible charge profile (price, CO2 neutral, …) 7) If needed/possible aggregator verifies with DSO if this is power-capacity wise feasible (and or load/phasing/voltage quality wise) here USEF (and or OSCP) protocols can play a in H2020 InterFlex project an aggregator use case with USEF has been executed and piloted 8) Aggregator sends charge profile to CPO (if needed indirectly) 9) CPO sends charge profile to EVSE 10) EVSE executes this profile and EV starts charging 11) Likely some specific billings/CDRs necessary to complete the settlement process.
5	Prerequisites	• User should agree in smart charging or have a contract with an aggregator.
6	Requirements	• The EV driver should have a possibility to override the smart charging, because he needs full power to fill up his EV battery. • The aggregator needs to have access to several information sources.
7	End Condition	• Battery of EV filled to users need level.

4. UC4 Transparent pricing – Tariff Communication

No.	**Type**	**Description**
1	Kind of Use case	System Use Case (ECISS UC4A)
2	Use case ID	The EV user wants to know the charging session tariff based on no contract
3	Objectives	Make charging session tariff knows to anyone who wants to know this.
3.1	Use case context	An EV User wants to know in general and before he/she wants to start charging the general charging session tariff based on an anonymous user profile. For this the EV User will look for a the charging session tariff which is going to be billed. This charging session tariff should be the same on the general websites, f.i. national platforms, and the CPO website/app. The charging session tariff contains the following tariff elements: VAT, Payment cost and actual cost for charging. The last one can be build from several sub-component like: service fee, energy, time, energy services, etc. The way the information is searched and found is out-of-scope of this use case. If cost are to be shown in a different format this would also fall into this use case. A topic which is discussed in Europe is the cost/100km.
4	Description	The CPO will have to determine this charging session tariff. This tariff should be seen as 'ad-hoc' price as defined in the EU AFID and is called in this use case the Pay-As-You-Go (PAYG) price. The CPO will have to inform via a standard interface with 3rd parties. The CPO will enforce a quality process in line with the consumer laws. This also applies for the process of updating this tariff information.
5	Prerequisites	• PAYG price must be in place • The standard protocol must support the tariff scheme's for PAYG, the update process and agreed between partners incl. data ownership •
6	Requirements	• Next to the protocol the transfer method should be selected and is secure • Automatic failure detection, re-connect and re-submit, SLA and enough bandwidth •
7	End Condition	• The charging session tariff (PAYG) is correct and accurate • The PAYG price is correctly show by 3rd parties • The correct PAYG is used when billing the customer • Tariff information is easily found by the EV user and thus complies with consumer law

No.	Type	Description
1	Kind of Use case	System Use Case (ECISS UC4B)
2	Use case ID	The EV user wants to know the charging session tariff based on the MSP contract
3	Objectives	The EV user wants to know, based on his contract with a MSP, what the charging session tariff will be applicable.
3.1	Use case context	The EV User wants to know, based on his MSP contract, which tariff is applicable. This is only known by the MSP. The prime contact for this is the contract party, the MSP. The MSP can choice an own tariff scheme or make use of the cost tariff of the CPO. In the first case a connection with the CPO for tariffs is not necessary but convenient. For the MSP the EV User tariffs must be actual and used for the billing. When the MSP is depending for the tariffs on the cost tariffs of the CPO a robust and accurate interface for tariffs must be in place. The MSP can choice for the PAYG price and negotiate a kick-back fee. It is also possible that MSP's share the EV User tariffs to 3rd parties. In this case an EV User can, based on his contract, also use 3rd party information sources. For the EV User the actual tariff used in charging session can also be shown by the CPO to the EV User, f.i. on the display of the charging station. Based on the consumption information on usage and costs can be shown to the EV User. At the end of a charging session the cost shown by CPO or MSP must be the same as on the invoice.
4	Description	The CPO will share both the PAYG price and the cost tariffs to the MSP. Even when the MSP does not use the PAYG price for the EV User tariff, this information is generally available. This could be implemented separately. The MSP should share the EV User tariff to the CPO as part of the charging process. After authentication, the EV User tariff should be communicated to the CPO to be displayed on the screen. This Also applies for usage and cost information and at the end of the charging session. If the MSP is using the PAYG price this information sharing process can be implemented smarter where the CPO is the responsible party to calculate and show this information. Sharing the EV User tariff by the MSP is in principal the only for the contract partners and not for the CPO to know. If this information is protected and therefore not accessible to the CPO, all usage and cost information must be calculated by the MSP. How to display this protected data on the display of the charging station is not yet in place.
5	Prerequisites	• PAYG price must be in place • CPO tariffs must be in place • EV User MSP tariffs must be in place • The standard protocol must support the tariff scheme's for PAYG, CPO tariffs, the update process and agreed between partners incl. data ownership

		• A standard protocol to support information from the MSP to the CPO must be in place: EV User MSP tariff, usage
6	Requirements	• Next to the protocol the transfer method should be selected and is secure • Automatic failure detection, re-connect and re-submit, SLA and enough bandwidth
7	End Condition	• The MSP must be able to show the correct price to the EV User based on the contract • The correct MSP tariff is used when billing the customer • Tariff information is easily found by the EV user and thus complies with consumer law

5. UC5 Other use cases

No.	Type	Description
1	Kind of Use case	Show chargepoints on apps, websites and in dash systems of Navigation Service Provider (NSP)
2	Use case ID	NSP01
3	Objectives	The EV driver can search, view and select chargepoints as a destination
3.1	Use case context	When the battery of the car is not charged to the desired state the EV driver should be able to find and select a chargepoint to navigate to and and to charge his car.
4	Description	1) The EV driver searches for chargepoint on website, app, navigation device or in-dash system 2) The EV Driver can define if it should be nearby or near a specific location or place. 3) The EV driver can select to view chargepoints that have a certain speed (fast, normal, slow) 4) The EV driver can select to view chargepoints that have a certain plug type 5) The EV driver can select any of the search results and show more information about the chargepoint 6) The EV driver should be able to see the price he has to pay for a charge on the chargepoint 7) The EV driver should be able to see if the EVSEs of the chargepoints are occupied or not occupied 8) The EV driver should be able to select one of the chargepoints for navigation via website, app, navigation device or in-dash system
5	Prerequisites	• The user should be able to make a considered decision to select a chargepoint and be able to navigate to the chargepoint
6	Requirements	• The EV driver should be able see basic information about the chargepoint like location, address, CPO and opening hours • The EV driver should be able to speed of which can be charged (slow, normal, fast) • The EV driver should be able to see if the EVSEs of the chargepoint are occupied, faulted or available • The EV driver should be able to select the chargepoint for navigation within his chosen navigation device, app or website.
7	End Condition	• The EV driver should arrive on the selected location and the information that was used to make the selection is correct upon arrival (where occupancy might be not available because of another user arriving between the moment of selection and arrival)

No.	Type	Description

1	Kind of Use case	EV driver should be able to select chargepoints based on radius of battery and route planned
2	Use case ID	NSP02
3	Objectives	The EV driver is warned by the navigation software that the available range of the car is not sufficient for the calculated route and that a chargepoint should be selected en route to arrive at the destination
3.1	Use case context	When the range of the battery is not sufficient for reaching the destination, the EV driver should be warned and given an option to charge en route. The user should be able to make a considered selection of the chargepoint.
4	Description	1) The EV driver plans a route on the navigation software in app, navigation software or in-dash system 2) Navigation software determines the route and the travelled distance 3) Navigation software determines based on current state of battery if the range is sufficient or not (with a safety margin) 4) Navigation will define if a charge (or multiple charges) are needed to reach the destination 5) Navigation software will show chargepoints along the route 6) EV Driver should have enough information to make a quick decision for a chargepoint: - Fast / slow charger - Occupied or not - # of minutes it will charge to a defined % 7) EV driver selects the chargepoint 8) Navigation software will recalculate the route with the selected charegepoint as stop on the route 9) Navigation software will inform the driver if the chargepoint is occupied in the period it driving to it. The navigation software then shows and alternative chargepoint (back to step 5)
5	Prerequisites	• The user should be able to make a considered decision to select a chargepoint along the route and be able to navigate to the chargepoint
6	Requirements	• The EV driver should be warned when the state of battery cannot provide the range to reach the destination • The EV driver should be presented with chargepoints along the route • The EV driver should be able to speed of which can be charged (slow, normal, fast) • The EV driver should be able to see if the EVSEs of the chargepoint are occupied or available • The EV driver should be able to select the chargepoint for navigation within his chosen navigation device, app or website.
7	End Condition	• The EV driver chose the chargepoint to navigate to along the route, arrives there and the information given is correct.

No.	Type	Description
1	Kind of Use case	Updating information in national chargepoints database (National Access Point)
2	Use case ID	NAP01
3	Objectives	A CPO wants to make information about its chargers publicly available
3.1	Use case context	When a CPO installs, removes or modifies any chargers, it wants to update information in the national database. This way up to date information is provided potential customers. Additionally the status of charger should be shared.
4	Description	1) A CPO installs chargers at a new location 2) The location information is send to the NAP (from the corresponding country), including location name, number of EVSEs, opening hours & tariff. 3) If a charger is being used, its status is updated in the NAP. 4) Once a charger is removed, the corresponding information is removed from the NAP.
5	Prerequisites	To keep the information in the NAP up to date, change requests are executed through a live connection between the NAP and the CPO.
6	Requirements	• A CPO should be able to add new chargers to the NAP • A CPO should be able to remove chargers from the NAP • A CPO should be able to update charger information in the NAP • A CPO should be able to update the charger status in the NAP
7	End Condition	• When the CPO has made the changes in the database, the information should be synced with NSPs.

No.	Type	Description
1	Kind of Use case	Services (like an NSP) should be able to retrieve up to date information from an NAP
2	Use case ID	NAP02
3	Objectives	The information in a NAP must be available live to other services.
3.1	Use case context	If an EV driver uses an information service (for example an NSP), this NSP must be able to retrieve live information from the NAP about chargers, both static (location, number of chargers) and dynamic (status).
4	Description	1) An information service provider keeps static information up to date by syncing with the NAP. 2) An EV driver requests information from an information service provider. 3) The information service provider requests live information of the corresponding location from the NAP. 4) The NAP sends the information to the information service provider. 5) The information service provider sends the information to the EV driver. 6) The EV driver should have the right information to decide to navigate to this charger or not.
5	Prerequisites	To make the information really useful for the EV driver, there should be no more than a couple of seconds delay in live information.

6	Requirements	• An NAP just be able to handle many simultaneous information requests by NSPs.
7	End Condition	• The information sent from the NAP to the NSP ends up at the user.

Observations and next steps

This document aims to define and describe a number of OCPI use cases. The use cases described in this document were devised during two workshops in which several market parties were present. The use cases can serve as a basis for the implementation of OCPI, but can also serve as a basis for the further development of OCPI.

Annex 1

Message details per use case

UC1 Smart Charging with ESP of User at Home

UC1	Step in Use Case	Sending Party/Role	Receiving Party/Role	Information	Protocol
	0A(prior)	User	ESP	registration user token at ESP	with APP of ESP
	0B(prior)	ESP	CSO	registration of ESP of user	OCPI likely
normal/std	1	User	CS	user token	NA/...
normal/std	2	EV	CS	connect	IEC 61851
normal/std	3	CS	CSO	user token	OCPP
normal/std	4	CSO	MSP	user token	OCPI
normal/std	5	MSP	CSO	token accepted	OCPI
normal/std	6	CSO	CS	start session	OCPP
	7	CSO	ESP	session started	OCPI likely
	8	ESP	CSO	load profile	OCPI likely
	9	CSO	CS	load profile	OCPP
normal/std	10	CS	CSO	session ended	OCPP
normal/std	11	CSO	MSP	session ended	OCPI
normal/std	12	CSO	MSP	CDR	OCPI
	13	CSO	ESP	session ended	OCPI likely

UC2 Smart Charging with ESP of the CSO

UC3	Step in Use Case	Sending Party/Role	Receiving Party/Role	Information	Protocol
	0A(prior)	User	ESP	registration user token at ESP	with APP of ESP
	0B(prior)	ESP	MSP	registration of ESP of user	OCPI likely
normal/std	1	User	CS	user token	NA/...
normal/std	2	EV	CS	connect	IEC 61851
normal/std	3	CS	CSO	user token	OCPP
normal/std	4	CSO	MSP	user token	OCPI
normal/std	5	MSP	CSO	token accepted	OCPI
normal/std	6	CSO	CS	start session	OCPP
	7	CSO	MSP	session started	OCPI
optional	8	MSP	CSO	User has a ESP	OCPI
optional	9	CSO	MSP	I have and use my own ESP	OCPI

	10	CSO	ESP	session started	OCPI likely
	11	ESP	CSO	load profile	OCPI likely
	12	CSO	CS	load profile	OCPP
normal/std	13	CS	CSO	session ended	OCPP
normal/std	14	CSO	MSP	session ended	OCPI
normal/std	15	CSO	MSP	CDR	OCPI
	16	CSO	ESP	session ended	OCPI likely

UC4 Transparent pricing

UC4	Step in Use Case	Sending Party/Role	Receiving Party/Role	Information	Protocol
User gets informed of P-A-Y-G CS pricing (the CSO-B2C price) (Pay-As-You-Go via CSO website, CSO APP, CSO's CS sticker or QR code)					
normal/std	1	User	CS	user token	NA/...
normal/std	2	CS	CSO	user token	OCPP
normal/std	3	CSO	MSP	user token	OCPI
		CSO	MSP	CSO informs B2B CS pricing to MSP (the CSO-B2B price) (or that it will only use the P-A-Y-G B2C price)	OCPI
If OK by CSO user gets informed of B2C MSP pricing (the MSP-B2C price)(via MSP APP or MSP website)					
normal/std	?	EV	CS	connect	IEC 61851
normal/std	4	MSP	CSO	token accepted	OCPI
normal/std	5	CSO	CS	start session	OCPP
normal/std	6	CS	CSO	session ended	OCPP
normal/std	7	CSO	MSP	session ended	OCPI
normal/std	8	CSO	MSP	CDR	OCPI

Annex 2

The UML of the OCPI Smart Charging concept from Jedlix