H. Reservation

# Introduction

This Functional Block describes the reservation functionality of OCPP. The reservation functionality enables an EV Driver to make a reservation of a Charging Station/EVSE, ensuring an available Connector at a Charging Station when he arrives.

With Charging Stations not being abundantly available, and EVs having limited range, EV Drivers plan their trips from Charging Station to Charging Station. They need to know for sure they can use a Charging Station they plan to go to. They don’t like it when another EV Driver has started using the Charging Station in the time they were traveling to the Charging Station.

For the EV Driver it is useful to be able to reserve a specific Type of Connector, or, when the EV Driver has no preference, an unspecified EVSE at a Charging Station. So he knows for sure he can charge at the Charging Station when he arrives.

# Use cases & Requirements

## H01 - Reservation

*Table 146. H01 - Reservation*

Charging Station

CSMS

|  |  |  |
| --- | --- | --- |
| **No.** | **Type** | **Description** |
| **1** | **Name** | Reservation |
| **2** | **ID** | H01 |
|  | *Functional block* | H. Reservation |
| **3** | **Objective(s)** | To ensure the EV Driver can charge his EV at a Charging Station, the EV Driver can make a reservation until a certain expiry time. |
| **4** | **Description** | This use case describes how a Charging Station can be reserved for a specific IdTokenType. |
| **5** | **Actors** | Charging Station, CSMS, EV Driver |
| *S1* | *Scenario objective* | Reserve an unspecified EVSE at a Charging Station |
|  | *Scenario description* | 1. EV Driver asks the CSMS to reserve an unspecified EVSE at the Charging Station. 2. The CSMS sends ReserveNowRequest without *evseId* to a Charging Station. 3. Upon receipt of ReserveNowRequest, the Charging Station responds with   ReserveNowResponse with status *Accepted*. |
|  | *Prerequisite(s)* | The Charging Station has at least one available EVSE |
|  | *Postcondition(s)* | **Successful postcondition:**  The Charging Station has accepted the ReserveNowRequest  **Failure postcondition:**  The Charging Station has rejected the ReserveNowRequest |



#### EV Driver



reserve

ReserveNowRequest(reservation.id, no evseId)

ReserveNowResponse(status = Accepted)

notification

**opt**

*Figure 77. Sequence Diagram: S1 - Reserve a unspecified EVSE at a Charging Station*

|  |  |  |
| --- | --- | --- |
| *S2* | *Scenario objective* | Reserve a specific EVSE at a Charging Station |
|  | *Scenario description* | 1. EV Driver asks the CSMS to reserve a specific EVSE at the Charging Station. 2. The CSMS sends ReserveNowRequest with a EVSE to a Charging Station. 3. Upon receipt of ReserveNowRequest, the Charging Station responds with   ReserveNowResponse with status *Accepted*.   1. The Charging Station sends StatusNotificationRequest with the status *Reserved* for all Connectors of that EVSE. 2. The CSMS responds with StatusNotificationResponse to the Charging Station. |
|  | *Prerequisite(s)* | The specified EVSE of the Charging Station has status *Available* |

Charging Station

CSMS

|  |  |  |
| --- | --- | --- |
|  | *Postcondition(s)* | **Successful postcondition:**  The Charging Station has accepted the ReserveNowRequest AND  sent StatusNotificationRequests with status *Reserved*.  **Failure postcondition:**  The Charging Station has rejected the ReserveNowRequest OR  The Charging Station has NOT sent StatusNotificationRequests with status *Reserved*. |



#### EV Driver



reserve

ReserveNowRequest(connectorId, ...)

ReserveNowResponse(status = Accepted)

**opt**

StatusNotificationRequest(status = Reserved, ...)

StatusNotificationResponse()

notification

*Figure 78. Sequence Diagram: S2 - Reserve a specified EVSE at a Charging Station*

|  |  |  |
| --- | --- | --- |
| *S3* | *Scenario objective* | Reserve a connector type at a Charging Station |
|  | *Scenario description* | 1. EV Driver asks the CSMS to reserve a connector type at the Charging Station. 2. The CSMS sends ReserveNowRequest with a connector type to a Charging Station. 3. Upon receipt of ReserveNowRequest, the Charging Station responds with   ReserveNowResponse with status *Accepted*. |
|  | *Prerequisite(s)* | The Charging Station has at least one available EVSE with the specified connector type |
|  | *Postcondition(s)* | **Successful postcondition:**  The Charging Station has accepted the ReserveNowRequest  **Failure postcondition:**  The Charging Station has rejected the ReserveNowRequest |



##### EV Driver

Charging Station

CSMS



reserve

ReserveNowRequest(ConnectorType is specified AND no evseId)

ReserveNowResponse(status = Accepted)

**opt**

notification

*Figure 79. Sequence Diagram: S3 - Reserve a connector type at a Charging Station*

|  |  |  |
| --- | --- | --- |
| **6** | **Error handling** |  |
| **7** | **Remark(s)** | It is RECOMMENDED to validate the Identifier with an AuthorizeRequest after reception of ReserveNowRequest and before the start of the transaction. |

### H01 - Reservation - Requirements

*Table 147. H01 - Requirements*

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Precondition** | **Requirement definition** | **Note** |
| H01.FR.01 | If the Charging Station is configured not to accept reservations. | The Charging Station SHALL return *Rejected*. |  |
| H01.FR.02 | If the reservationId in the ReserveNowRequest matches a reservation in the Charging Station. | The Charging Station SHALL replace that reservation with the new reservation in the request. |  |
| H01.FR.03 | If the reservationId in the ReserveNowRequest does not match any reservation in the Charging Station. | The Charging Station SHALL return the status value  *Accepted* if it succeeds in reserving an EVSE. |  |
| H01.FR.04 | If the Charging Station receives a ReserveNowRequest without *evseId*  AND at least one EVSE is *Available*  AND H01.FR.18 | The Charging Station SHALL accept the reservation AND respond with a ReserveNowResponse with status *Accepted*. |  |
| H01.FR.06 | If the Charging Station receives a ReserveNowRequest with a connector  type  AND at least one EVSE with the  specified connector type is *Available*  AND H01.FR.18 | The Charging Station SHALL accept the reservation AND respond with a ReserveNowResponse with status *Accepted*. |  |
| H01.FR.07 | When the Charging Station has *Accepted* a ReserveNowRequest without *evseId* | The Charging Station SHALL make sure that at any time during the validity of the reservation, one EVSE remains available for the reserved IdTokenType. |  |
| H01.FR.09 | When the Charging Station has *Accepted* a ReserveNowRequest with a connector type | The Charging Station SHALL make sure that at any time during the validity of the reservation, one Connector with the specified type remains available for the reserved IdTokenType. |  |
| H01.FR.11 | When receiving a ReserveNowRequest AND (all) targeted EVSEs have status *Reserved* | The Charging Station SHALL return *Occupied*. |  |
| H01.FR.12 | When receiving a ReserveNowRequest AND (all) targeted EVSEs have status *Faulted* | The Charging Station SHALL return *Faulted*. |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Precondition** | **Requirement definition** | **Note** |
| H01.FR.13 | When receiving a ReserveNowRequest AND (all) targeted EVSEs have status *Occupied* | The Charging Station SHALL return *Occupied*. |  |
| H01.FR.14 | When receiving a ReserveNowRequest AND (all) targeted EVSEs have status *Unavailable* | The Charging Station SHALL return *Unavailable*. |  |
| H01.FR.15 | If a transaction for the reserved IdTokenType is started. | The Charging Station SHALL send the reservationId in a TransactionEventRequest. | To notify the CSMS that the reservation is terminated. See E. Transactions. |
| H01.FR.16 | When the status of a targeted EVSE changes to *Faulted* | The Charging Stations SHALL cancel the reservation AND send a ReservationStatusUpdate with status *Removed*. |  |
| H01.FR.17 | When the status of a targeted EVSE changes to *Unavailable* | The Charging Stations SHALL cancel the reservation AND send a ReservationStatusUpdate with status *Removed*. |  |
| H01.FR.18 | If the Configuration Variable: ReservationNonEvseSpecific is set to *true*. | The Charging Station SHALL accept reservations on an unspecified EVSE. |  |
| H01.FR.19 | If the Configuration Variable: ReservationNonEvseSpecific is not set or set to *false*. | The Charging Station SHALL reject reservations on an unspecified EVSE. |  |
| H01.FR.20 | H01.FR.04 OR H01.FR.06 AND  amount of EVSEs available equals the amount of reservations | The Charging Station SHALL set all available EVSEs to *Reserved*. |  |

## H02 - Cancel Reservation

*Table 148. H02 - Cancel Reservation*

Charging Station

CSMS

|  |  |  |
| --- | --- | --- |
| **No.** | **Type** | **Description** |
| **1** | **Name** | Cancel Reservation |
| **2** | **ID** | H02 |
|  | *Functional block* | H. Reservation |
| **3** | **Objective(s)** | To cancel a reservation on a Charging Station. |
| **4** | **Description** | This use case describes how an EV Driver can cancel an existing reservation. The CSMS can cancel the reservation the EV Driver has on a Charging Station. |
|  | *Actors* | Charging Station, CSMS, EV Driver |
|  | *Scenario description* | 1. EV Driver asks the CSMS to cancel a reservation. 2. To cancel a reservation the CSMS sends CancelReservationRequest to the Charging Station. 3. If the Charging Station has a reservation matching the reservationId in the request PDU, it   returns the status *Accepted*.   1. If a specific EVSE was reserved for this reservation, the Charging Station sends StatusNotificationRequest with the status *Available* for all the Connectors of that EVSE. 2. The CSMS responds with StatusNotificationResponse to the Charging Station. 3. The reservation is cancelled. |
| **5** | **Prerequisite(s)** | * The Functional Block *Reservation* is installed. * EV Driver has a reservation at the Charging Station. |
| **6** | **Postcondition(s)** | **Successful postcondition:**  The CSMS was able to cancel the EV Driver’s reservation at the Charging Stations.  **Failure postcondition:**  n/a. |



User



Cancel reservation

CancelReservationRequest(reservationId)

**opt [Specific EVSE reserved]**

StatusNotificationRequest(status = Available)

StatusNotificationResponse()

CancelReservationResponse(status = Accepted)

*Figure 80. Sequence Diagram: Cancel Reservation*

|  |  |  |
| --- | --- | --- |
| **7** | **Error handling** | n/a |
| **8** | **Remark(s)** | The Charging Station does not send a ReservationStatusUpdate, because it was explicitly cancelled by CSMS, so it is already aware of the event. |

### H02 - Cancel Reservation - Requirements

*Table 149. H02 - Requirements*

|  |  |  |
| --- | --- | --- |
| **ID** | **Precondition** | **Requirement definition** |
| H02.FR.01 | The Charging Station has received a CancelReservationRequest and no matching reservationId. | The Charging Station SHALL return *Rejected*. |

|  |  |  |
| --- | --- | --- |
| **ID** | **Precondition** | **Requirement definition** |
| H02.FR.02 | If a Charging Station receives a CancelReservationRequest with a valid, known reservationId. | The reservation SHALL be cancelled. |

## H03 - Use a reserved EVSE

Charging Station

CSMS

|  |  |  |
| --- | --- | --- |
| **No.** | **Type** | **Description** |
| **1** | **Name** | Use a reserved EVSE |
| **2** | **ID** | H03 |
|  | *Functional block* | H. Reservation |
| **3** | **Objective(s)** | Use a reserved EVSE |
| **4** | **Description** | This use cases covers how a reserved EVSE can be used based on IdToken and GroupIdToken information. |
|  | *Actors* | Charging Station, CSMS, EV Driver |
| *S1* | *Scenario objective* | Use an EVSE reserved by the same IdToken |
|  | *Scenario description* | 1. The CSMS sends a ReserveNowRequest to a Charging Station to reserve an EVSE   for use by a specific IdTokenType.   1. Upon receipt of the ReserveNowRequest, the Charging Station responds with a   ReserveNowResponse.   1. When a specific EVSE is reserved for this reservation, the Charging Station sends a StatusNotificationRequest with the status *Reserved* for all the Connectors of that   EVSE.   1. The CSMS responds with a StatusNotificationResponse to the Charging Station. 2. The EV Driver presents an IdTokenType at the Charging Station, and the IdTokenType is the same as the reservation’s IdTokenType, the Charging Station recognizes the IdTokenType and starts charging and E02 - Start Transaction - Cable   Plugin First applies. |
| **5** | **Prerequisite(s)** | n/a |
| **6** | **Postcondition(s)** | n/a |

###### EV Driver



reserve

ReserveNowRequest(connectorId, idToken = TOKEN\_A, ...) ReserveNowResponse(status = Accepted)

**opt [When a specific EVSE is reserved for this reservation]**

StatusNotificationRequest(status = Reserved, ...) StatusNotificationResponse()

Present IdToken(TOKEN\_A)

Continue regular charging session

*Figure 81. Sequence Diagram: Use a reserved EVSE with IdToken*

|  |  |  |
| --- | --- | --- |
| *S2* | *Scenario objective* | Use an EVSE reserved by the same GroupIdToken |

Charging Station

CSMS

|  |  |  |
| --- | --- | --- |
|  | *Scenario description* | 1. The CSMS sends a ReserveNowRequest with the GroupId to a Charging Station to   reserve a EVSE for use by a specific IdTokenType.   1. Upon receipt of the ReserveNowRequest, the Charging Station responds with a   ReserveNowResponse.   1. When a specific EVSE is reserved for this reservation, the Charging Station sends a StatusNotificationRequest with the status *Reserved* for all the Connectors of that   EVSE.   1. The CSMS responds with a StatusNotificationResponse to the Charging Station. 2. The EV Driver presents an IdTokenType at the Charging Station, and the IdTokenType is different from the reservation’s IdTokenType, the Charging Station   sends an AuthorizeRequest to the CSMS.   1. The CSMS responds with an AuthorizeResponse. This response message includes   the GroupId.   1. Based on the matching GroupId information in both responses, the Charging Station   starts charging and E02 - Start Transaction - Cable Plugin First applies. |
| **5** | **Prerequisite(s)** | n/a |
| **6** | **Postcondition(s)** | n/a |



EV Driver



reserve

ReserveNowRequest(connectorId, idToken = TOKEN\_A, groupIdToken = TOKEN\_P)

**opt [When a specific EVSE is reserved for this reservation]**

StatusNotificationRequest(status = Reserved, ...)

Present IdToken(TOKEN\_B)

**alt**

AuthorizeResponse(idTokenInfo(groupIdToken = TOKEN\_P))

Continue regular transaction

**[If TOKEN\_B is NOT found in the Local Authorization List or Authorization Cache]**

AuthorizeRequest(idToken = TOKEN\_B)

StatusNotificationResponse()

ReserveNowResponse(status = Accepted)

*Figure 82. Sequence Diagram: Use a reserved EVSE with GroupId*

|  |  |  |
| --- | --- | --- |
| **7** | **Error handling** | n/a |
| **8** | **Remark(s)** | n/a |

### H03 - Use a reserved EVSE - Requirements

*Table 150. H03 - Requirements*

|  |  |  |
| --- | --- | --- |
| **ID** | **Precondition** | **Requirement definition** |
| H03.FR.01 | Reservation is pending for a specific *idToken* for a specific *evseId* | The Charging Station SHALL allow charging on that EVSE when IdToken presented for authorization matches the specific *idToken* from the reservation. |
| H03.FR.02 | Reservation is pending for a specific *idToken* for a specific *connectorType* | The Charging Station SHALL allow charging on an EVSE with a connector of type *connectorType* when IdToken presented for authorization matches the specific *idToken* from the reservation. |
| H03.FR.03 | Reservation is pending for a specific *idToken*  without a specific *evseId* or *connectorType* | The Charging Station SHALL allow charging on an EVSE when IdToken presented for authorization matches the specific *idToken* from the reservation. |
| H03.FR.04 | H03.FR.01 AND  attribute *groupIdToken* in reservation has a value | The Charging Station SHALL allow charging on that EVSE when IdToken presented for authorization matches the specific *idToken* from the reservation or when the associated *groupIdToken* matches. |
| H03.FR.05 | H03.FR.02 AND  attribute *groupIdToken* in reservation has a value | The Charging Station SHALL allow charging on an EVSE with a connector of type *connectorType* when IdToken presented for authorization matches the specific *idToken* from the reservation or when the associated *groupIdToken* matches. |
| H03.FR.06 | H03.FR.03 AND  attribute *groupIdToken* in reservation has a value | The Charging Station SHALL allow charging on any EVSE when IdToken presented for authorization matches the specific *idToken* from the reservation or when the associated *groupIdToken* matches. |
| H03.FR.07 | If attribute *groupIdToken* in the reservation has a value (it is optional). | In order to determine the *groupIdToken* that is associated with an incoming IdToken, the Charging Station MAY look it up in its Local Authorization List or Authorization Cache. |
| H03.FR.08 | H03.FR.07 AND  If it is not found in the Local Authorization List or Authorization Cache. | The Charging Station SHALL send an AuthorizeRequest for the incoming IdToken to the CSMS in order to get its associated *groupIdToken*. |

## H04 - Reservation Ended, not used

|  |  |  |
| --- | --- | --- |
| **No.** | **Type** | **Description** |
| **1** | **Name** | Reservation Ended, not used |
| **2** | **ID** | H04 |
|  | *Functional block* | H. Reservation |
| **3** | **Objective(s)** | To enable a Charging Station to notify the CSMS about a reservation that has expired. |
| **4** | **Description** | This use cases covers how the Charging Station notifies the CSMS about a reservation, that has ended/timed out before the EV Driver starts using the Charging Station. |
|  | *Actors* | Charging Station, CSMS |
|  | *Scenario description* | 1. The Charging Station has a reservation. 2. The expiryDate of the reservation is reached. 3. The Charging Station removes the reservation . 4. If a specific EVSE was reserved for this reservation, the Charging Station makes the EVSE available again and notifies the CSMS about this by sending a StatusNotificationRequest with the   status *Available* for that all the Connectors of that EVSE.   1. The CSMS responds with a StatusNotificationResponse. 2. The Charging Station sends a ReservationStatusUpdateRequest with status *Expired* to the   CSMS.   1. The CSMS responds with a ReservationStatusUpdateResponse. |
| **5** | **Prerequisite(s)** | n/a |
| **6** | **Postcondition(s)** | n/a |

Charging Station

CSMS

Reservation ended, expiryDateTime is reached

StatusNotificationResponse()

ReservationStatusUpdateResponse()

ReservationStatusUpdateRequest(reservationId, reservationUpdateStatus = Expired)

**[Specific EVSE reserved]**

StatusNotificationRequest(status = Available)

**alt**

*Figure 83. Sequence Diagram: Reservation Ended, not used*

|  |  |  |
| --- | --- | --- |
| **7** | **Error handling** | **n/a** |
| **8** | **Remark(s)** | n/a |

### H04 - Reservation Ended, not used - Requirements

*Table 151. H04 - Requirements*

|  |  |  |
| --- | --- | --- |
| **ID** | **Precondition** | **Requirement definition** |
| H04.FR.01 | The reservation ends (*expiryDateTime* reached) | The Charging Station SHALL send a ReservationStatusUpdateRequest with status *Expired*. |
| H04.FR.02 | H04.FR.01 AND  If a specific EVSE was reserved for this reservation | The Charging Station SHALL allow charging again on this EVSE. |
| H04.FR.03 | H04.FR.02 | The Charging Station SHALL send a StatusNotificationRequest with status *Available* to the CSMS, notifying the CSMS the all the connectors of this EVSE are available again for any EV Driver. |