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# H. Reservation

# 1. 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.

## 2. Use cases & Requirements

### H01 - Reservation

Table 146. H01 - Reservation

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 <a href="#">IdTokenType</a> .
5	Actors	Charging Station, CSMS, EV Driver
S1	Scenario objective	Reserve an unspecified EVSE at a Charging Station
	Scenario description	<ol style="list-style-type: none"> <li>1. EV Driver asks the CSMS to reserve an unspecified EVSE at the Charging Station.</li> <li>2. The CSMS sends <a href="#">ReserveNowRequest</a> without <i>evseId</i> to a Charging Station.</li> <li>3. Upon receipt of <a href="#">ReserveNowRequest</a>, the Charging Station responds with <a href="#">ReserveNowResponse</a> with status <i>Accepted</i>.</li> </ol>
	Prerequisite(s)	The Charging Station has at least one available EVSE
	Postcondition(s)	<b>Successful postcondition:</b> The Charging Station has accepted the <a href="#">ReserveNowRequest</a> <b>Failure postcondition:</b> The Charging Station has rejected the <a href="#">ReserveNowRequest</a>

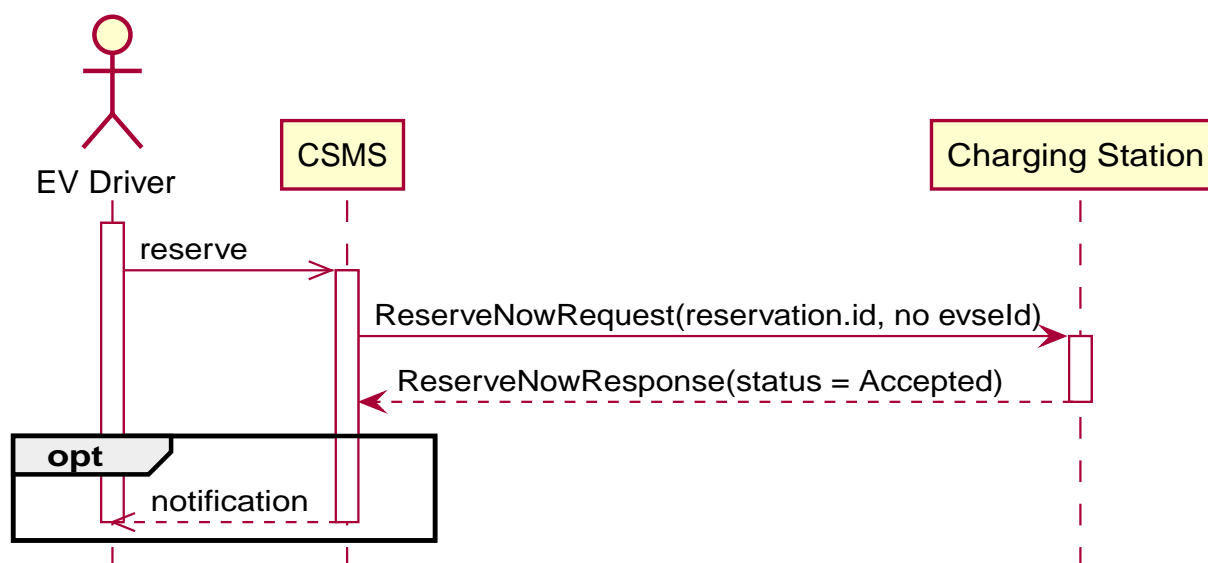


Figure 77. Sequence Diagram: S1 - Reserve a unspecified EVSE at a Charging Station

S2	Scenario objective	Reserve a specific EVSE at a Charging Station
	Scenario description	<ol style="list-style-type: none"> <li>1. EV Driver asks the CSMS to reserve a specific EVSE at the Charging Station.</li> <li>2. The CSMS sends <a href="#">ReserveNowRequest</a> with a EVSE to a Charging Station.</li> <li>3. Upon receipt of <a href="#">ReserveNowRequest</a>, the Charging Station responds with <a href="#">ReserveNowResponse</a> with status <i>Accepted</i>.</li> <li>4. The Charging Station sends <a href="#">StatusNotificationRequest</a> with the status <i>Reserved</i> for all Connectors of that EVSE.</li> <li>5. The CSMS responds with <a href="#">StatusNotificationResponse</a> to the Charging Station.</li> </ol>
	Prerequisite(s)	The specified EVSE of the Charging Station has status <i>Available</i>

	<b>Postcondition(s)</b> <b>Successful postcondition:</b> The Charging Station has accepted the <a href="#">ReserveNowRequest</a> AND sent <a href="#">StatusNotificationRequests</a> with status <i>Reserved</i> . <b>Failure postcondition:</b> The Charging Station has rejected the <a href="#">ReserveNowRequest</a> OR The Charging Station has NOT sent <a href="#">StatusNotificationRequests</a> with status <i>Reserved</i> .
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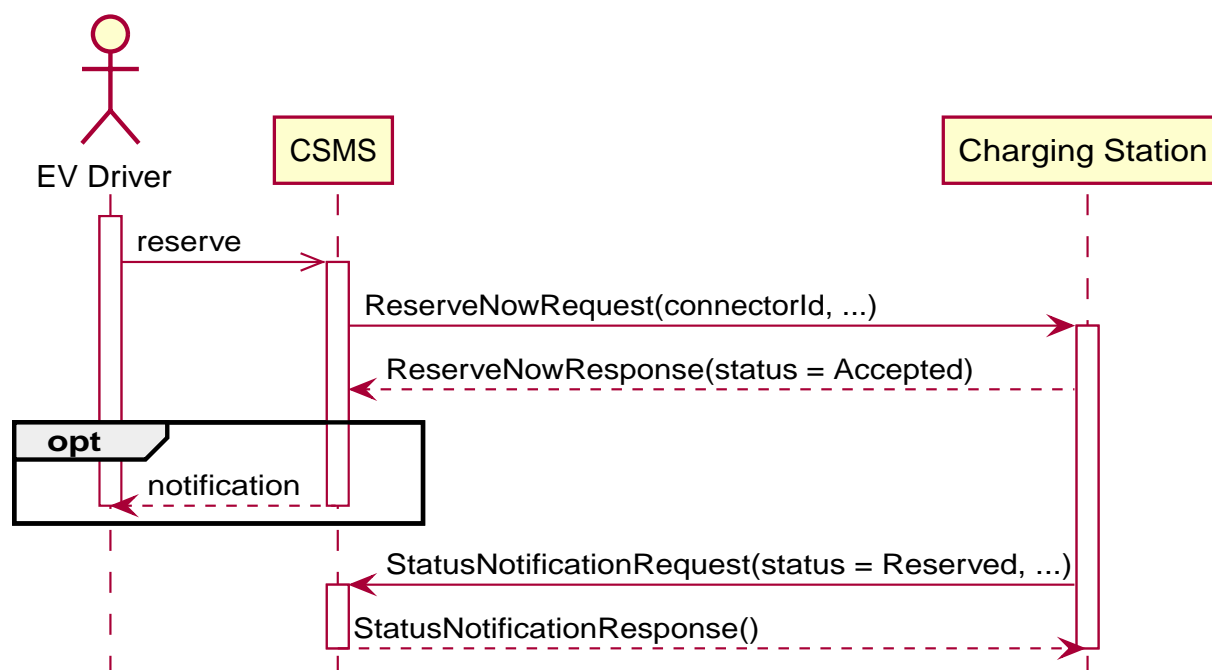


Figure 78. Sequence Diagram: S2 - Reserve a specified EVSE at a Charging Station

S3	Scenario objective	Reserve a connector type at a Charging Station
	Scenario description	<ol style="list-style-type: none"> <li>1. EV Driver asks the CSMS to reserve a connector type at the Charging Station.</li> <li>2. The CSMS sends <a href="#">ReserveNowRequest</a> with a connector type to a Charging Station.</li> <li>3. Upon receipt of <a href="#">ReserveNowRequest</a>, the Charging Station responds with <a href="#">ReserveNowResponse</a> with status <i>Accepted</i>.</li> </ol>
	Prerequisite(s)	The Charging Station has at least one available EVSE with the specified connector type
	Postcondition(s)	<b>Successful postcondition:</b> The Charging Station has accepted the <a href="#">ReserveNowRequest</a> <b>Failure postcondition:</b> The Charging Station has rejected the <a href="#">ReserveNowRequest</a>

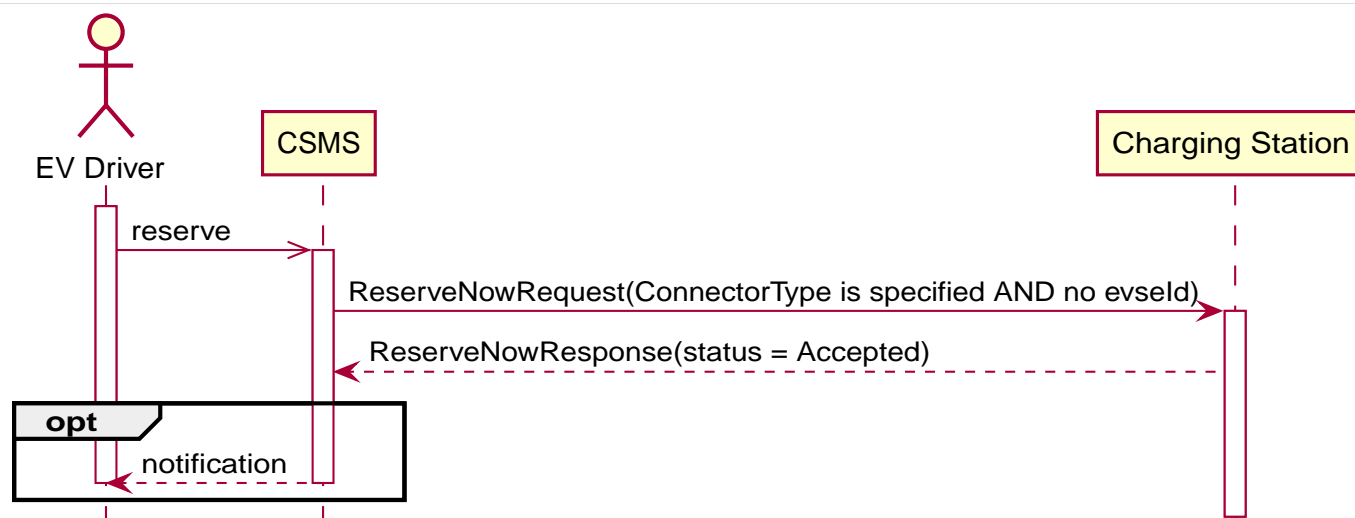


Figure 79. Sequence Diagram: S3 - Reserve a connector type at a Charging Station

6	Error handling	
7	Remark(s)	It is RECOMMENDED to validate the Identifier with an <a href="#">AuthorizeRequest</a> after reception of <a href="#">ReserveNowRequest</a> 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 <i>Rejected</i> .	
H01.FR.02	If the reservationId in the <a href="#">ReserveNowRequest</a> 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 <a href="#">ReserveNowRequest</a> does not match any reservation in the Charging Station.	The Charging Station SHALL return the status value <i>Accepted</i> if it succeeds in reserving an EVSE.	
H01.FR.04	If the Charging Station receives a <a href="#">ReserveNowRequest</a> without <i>evseld</i> AND at least one EVSE is <i>Available</i> AND H01.FR.18	The Charging Station SHALL accept the reservation AND respond with a <a href="#">ReserveNowResponse</a> with status <i>Accepted</i> .	
H01.FR.06	If the Charging Station receives a <a href="#">ReserveNowRequest</a> with a connector type AND at least one EVSE with the specified connector type is <i>Available</i> AND H01.FR.18	The Charging Station SHALL accept the reservation AND respond with a <a href="#">ReserveNowResponse</a> with status <i>Accepted</i> .	
H01.FR.07	When the Charging Station has <i>Accepted</i> a <a href="#">ReserveNowRequest</a> without <i>evseld</i>	The Charging Station SHALL make sure that at any time during the validity of the reservation, one EVSE remains available for the reserved <a href="#">IdTokenType</a> .	
H01.FR.09	When the Charging Station has <i>Accepted</i> a <a href="#">ReserveNowRequest</a> 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 <a href="#">IdTokenType</a> .	
H01.FR.11	When receiving a <a href="#">ReserveNowRequest</a> AND (all) targeted EVSEs have status <i>Reserved</i>	The Charging Station SHALL return <i>Occupied</i> .	
H01.FR.12	When receiving a <a href="#">ReserveNowRequest</a> AND (all) targeted EVSEs have status <i>Faulted</i>	The Charging Station SHALL return <i>Faulted</i> .	

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

## H02 - Cancel Reservation

Table 148. H02 - Cancel Reservation

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	<ol style="list-style-type: none"> <li>1. EV Driver asks the CSMS to cancel a reservation.</li> <li>2. To cancel a reservation the CSMS sends <a href="#">CancelReservationRequest</a> to the Charging Station.</li> <li>3. If the Charging Station has a reservation matching the reservationId in the request PDU, it returns the status <i>Accepted</i>.</li> <li>4. If a specific EVSE was reserved for this reservation, the Charging Station sends <a href="#">StatusNotificationRequest</a> with the status <i>Available</i> for all the Connectors of that EVSE.</li> <li>5. The CSMS responds with <a href="#">StatusNotificationResponse</a> to the Charging Station.</li> <li>6. The reservation is cancelled.</li> </ol>
5	Prerequisite(s)	<ul style="list-style-type: none"> <li>- The Functional Block <i>Reservation</i> is installed.</li> <li>- EV Driver has a reservation at the Charging Station.</li> </ul>
6	Postcondition(s)	<p><b>Successful postcondition:</b> The CSMS was able to cancel the EV Driver's reservation at the Charging Stations.</p> <p><b>Failure postcondition:</b> n/a.</p>

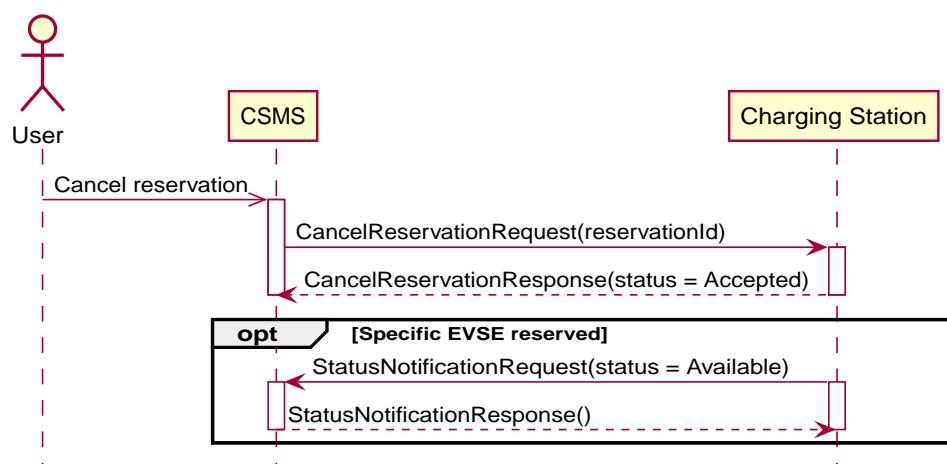


Figure 80. Sequence Diagram: Cancel Reservation

7	Error handling	n/a
8	Remark(s)	The Charging Station does not send a <a href="#">ReservationStatusUpdate</a> , 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 <a href="#">CancelReservationRequest</a> and no matching reservationId.	The Charging Station SHALL return <i>Rejected</i> .

ID	Precondition	Requirement definition
H02.FR.02	If a Charging Station receives a <a href="#">CancelReservationRequest</a> with a valid, known reservationId.	The reservation SHALL be cancelled.

## H03 - Use a reserved EVSE

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	<ol style="list-style-type: none"> <li>1. The CSMS sends a <a href="#">ReserveNowRequest</a> to a Charging Station to reserve an EVSE for use by a specific <a href="#">IdTokenType</a>.</li> <li>2. Upon receipt of the <a href="#">ReserveNowRequest</a>, the Charging Station responds with a <a href="#">ReserveNowResponse</a>.</li> <li>3. When a specific EVSE is reserved for this reservation, the Charging Station sends a <a href="#">StatusNotificationRequest</a> with the status <i>Reserved</i> for all the Connectors of that EVSE.</li> <li>4. The CSMS responds with a <a href="#">StatusNotificationResponse</a> to the Charging Station.</li> <li>5. The EV Driver presents an <a href="#">IdTokenType</a> at the Charging Station, and the <a href="#">IdTokenType</a> is the same as the reservation's <a href="#">IdTokenType</a>, the Charging Station recognizes the <a href="#">IdTokenType</a> and starts charging and <a href="#">E02 - Start Transaction - Cable Plugin First</a> applies.</li> </ol>
5	Prerequisite(s)	n/a
6	Postcondition(s)	n/a

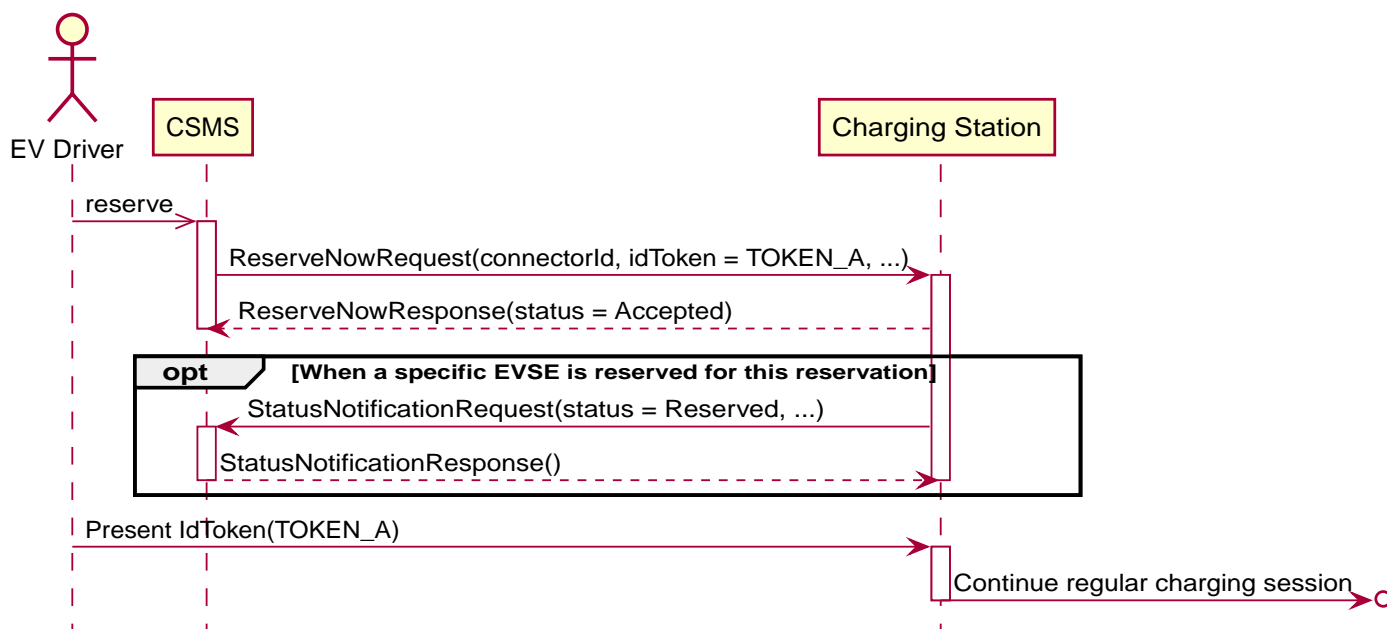


Figure 81. Sequence Diagram: Use a reserved EVSE with IdToken

S2	Scenario objective	Use an EVSE reserved by the same GroupIdToken
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	Scenario description	<ol style="list-style-type: none"> <li>1. The CSMS sends a <a href="#">ReserveNowRequest</a> with the GroupId to a Charging Station to reserve a EVSE for use by a specific <a href="#">IdTokenType</a>.</li> <li>2. Upon receipt of the <a href="#">ReserveNowRequest</a>, the Charging Station responds with a <a href="#">ReserveNowResponse</a>.</li> <li>3. When a specific EVSE is reserved for this reservation, the Charging Station sends a <a href="#">StatusNotificationRequest</a> with the status <i>Reserved</i> for all the Connectors of that EVSE.</li> <li>4. The CSMS responds with a <a href="#">StatusNotificationResponse</a> to the Charging Station.</li> <li>5. The EV Driver presents an <a href="#">IdTokenType</a> at the Charging Station, and the <a href="#">IdTokenType</a> is different from the reservation's <a href="#">IdTokenType</a>, the Charging Station sends an <a href="#">AuthorizeRequest</a> to the CSMS.</li> <li>6. The CSMS responds with an <a href="#">AuthorizeResponse</a>. This response message includes the GroupId.</li> <li>7. Based on the matching GroupId information in both responses, the Charging Station starts charging and <a href="#">E02 - Start Transaction - Cable Plugin First</a> applies.</li> </ol>
5	Prerequisite(s)	n/a
6	Postcondition(s)	n/a

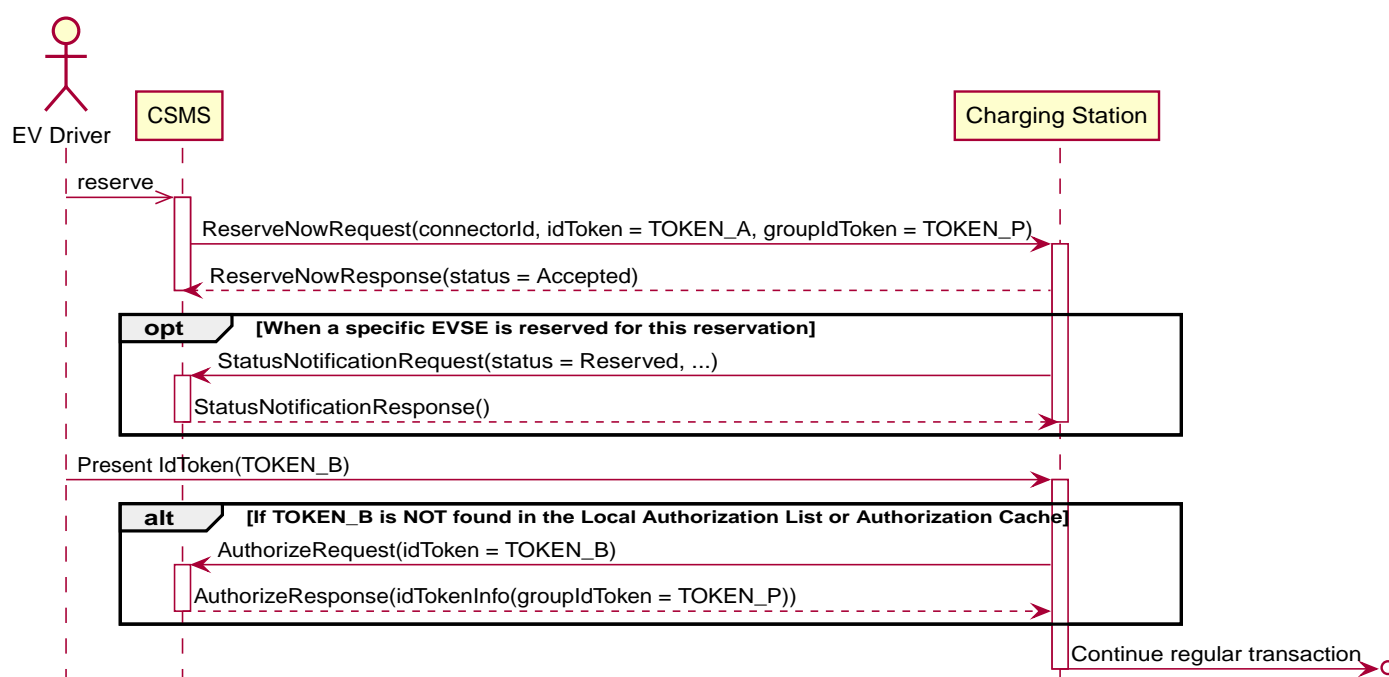


Figure 82. Sequence Diagram: Use a reserved EVSE with GroupId

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 <i>idToken</i> for a specific <i>evseId</i>	The Charging Station SHALL allow charging on that EVSE when <i>IdToken</i> presented for authorization matches the specific <i>idToken</i> from the reservation.
H03.FR.02	Reservation is pending for a specific <i>idToken</i> for a specific <i>connectorType</i>	The Charging Station SHALL allow charging on an EVSE with a connector of type <i>connectorType</i> when <i>IdToken</i> presented for authorization matches the specific <i>idToken</i> from the reservation.
H03.FR.03	Reservation is pending for a specific <i>idToken</i> without a specific <i>evseId</i> or <i>connectorType</i>	The Charging Station SHALL allow charging on an EVSE when <i>IdToken</i> presented for authorization matches the specific <i>idToken</i> from the reservation.
H03.FR.04	H03.FR.01 AND attribute <i>groupIdToken</i> in reservation has a value	The Charging Station SHALL allow charging on that EVSE when <i>IdToken</i> presented for authorization matches the specific <i>idToken</i> from the reservation or when the associated <i>groupIdToken</i> matches.
H03.FR.05	H03.FR.02 AND attribute <i>groupIdToken</i> in reservation has a value	The Charging Station SHALL allow charging on an EVSE with a connector of type <i>connectorType</i> when <i>IdToken</i> presented for authorization matches the specific <i>idToken</i> from the reservation or when the associated <i>groupIdToken</i> matches.
H03.FR.06	H03.FR.03 AND attribute <i>groupIdToken</i> in reservation has a value	The Charging Station SHALL allow charging on any EVSE when <i>IdToken</i> presented for authorization matches the specific <i>idToken</i> from the reservation or when the associated <i>groupIdToken</i> matches.
H03.FR.07	If attribute <i>groupIdToken</i> in the reservation has a value (it is optional).	In order to determine the <i>groupIdToken</i> that is associated with an incoming <i>IdToken</i> , 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 <i>AuthorizeRequest</i> for the incoming <i>IdToken</i> to the CSMS in order to get its associated <i>groupIdToken</i> .

## 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	<ol style="list-style-type: none"> <li>1. The Charging Station has a reservation.</li> <li>2. The expiryDate of the reservation is reached.</li> <li>3. The Charging Station removes the reservation .</li> <li>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 <a href="#">StatusNotificationRequest</a> with the status <i>Available</i> for that all the Connectors of that EVSE.</li> <li>5. The CSMS responds with a <a href="#">StatusNotificationResponse</a>.</li> <li>6. The Charging Station sends a <a href="#">ReservationStatusUpdateRequest</a> with status <i>Expired</i> to the CSMS.</li> <li>7. The CSMS responds with a <a href="#">ReservationStatusUpdateResponse</a>.</li> </ol>
5	Prerequisite(s)	n/a
6	Postcondition(s)	n/a

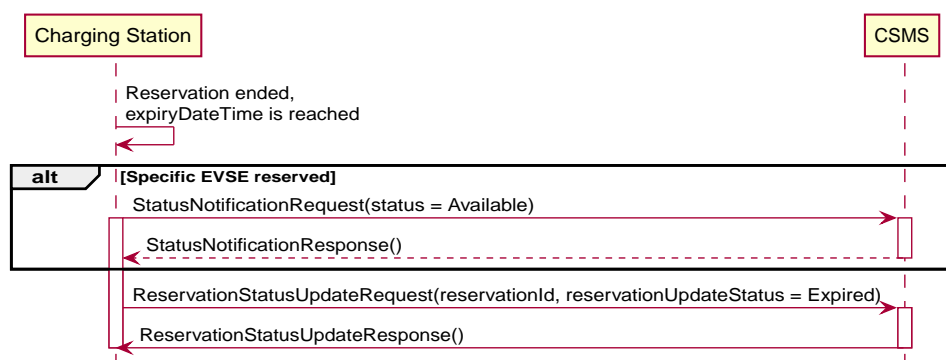


Figure 83. Sequence Diagram: Reservation Ended, not used

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 ( <i>expiryDateTime</i> reached)	The Charging Station SHALL send a <a href="#">ReservationStatusUpdateRequest</a> with status <i>Expired</i> .
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 <a href="#">StatusNotificationRequest</a> with status <i>Available</i> to the CSMS, notifying the CSMS the all the connectors of this EVSE are available again for any EV Driver.