
G. Availability

1. Introduction

This Functional Block specifies how the Charging Station can inform the CSMS of its current availability for starting new transactions.

For the CSO it is important to know if a Charging Station is available for new EVs to be charged. The CSO wants to know this information so they can tell EV Drivers whether the Charging Station is available. To know this, the Charging Station should send any status changes of itself or one of its EVSEs to the CSMS. See for an example: [B04 - Offline Behavior Idle Charging Station](#).

For the CSO it is very helpful to know the status of the transaction, therefore the Charging Station can send detailed statuses to the CSMS. This can be very useful when helping an EV Driver when he experiences problems during charging.

When a fault is detected by the Charging Station it can send a message notifying the CSMS about the fault.

When the CSO wants the Charging Station to no longer start new transactions, it can change the availability. For example: they need to do maintenance on the Charging Station, and for this reason they don't want the Charging Station to be in use.

The CSO can also change the availability for one or more EVSEs. For example: A customer calls, complaining about a broken EVSE on the Charging Station. The CSO can then set the Connector to unavailable, making it impossible for an EV Driver to use that Connector.

Obviously, it is also possible to make the Charging Station or a Connector available again with a command from the CSMS.

NOTE | An overview of the Connectors Statuses can be found in: [ConnectorStatusEnumType](#).

2. Use cases & Requirements

G01 - Status Notification

Table 136. G01 - Status Notification

No.	Type	Description
1	Name	Status Notification
2	ID	G01
	Functional block	G. Availability
3	Objective(s)	To inform the CSMS about a Connector status change.
4	Description	This use case covers the functionality that a Charging Station sends a notification to the CSMS to inform the CSMS about a Connector status change.
	Actors	Charging Station, CSMS
	Scenario description	<ol style="list-style-type: none"> 1. A connector status changed, the Charging Station sends a StatusNotificationRequest to the CSMS to inform the CSMS about the new status. 2. The CSMS responds with StatusNotificationResponse to the Charging Station.
5	Prerequisite(s)	n/a
6	Postcondition(s)	Successful postconditions: The CSMS is <i>Successfully</i> informed about the status change. Failure postconditions: n/a

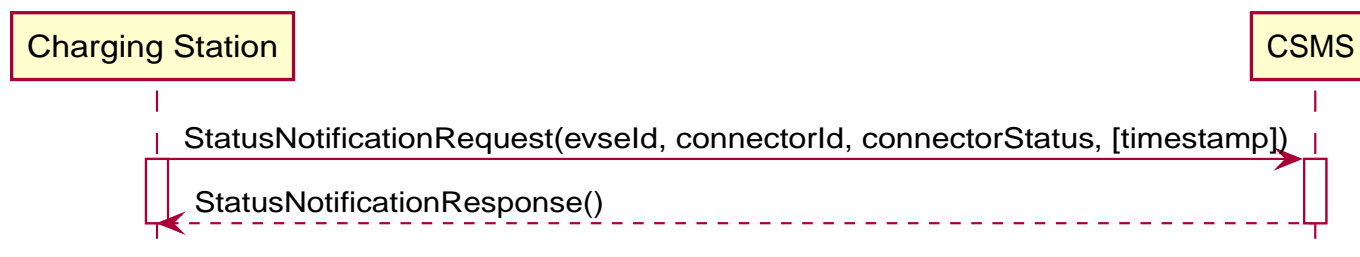


Figure 72. Sequence Diagram: Status Notification

7	Error handling	n/a
8	Remark(s)	<p>The Charging Station MAY use the <i>Unavailable</i> status internally for other purposes (e.g. while updating firmware or waiting for an initial <i>Accepted</i> RegistrationStatus). When one of the connectors on an EVSE is Reserved/Occupied, the CSMS has to take care of the status of the other connectors when presenting availability information to another system or user. The CSMS knows which connectors belong to the same EVSE.</p> <p>Notifying a connector status from the Charging Station to the CSMS will be taken over by the new Device Management Monitoring feature, however this mechanism has not been proven in the field yet. So the old StatusNotificationRequest message remains available for use for now.</p>

G01 - Status Notification - Requirements

Table 137. G01 - Requirements

ID	Precondition	Requirement definition
G01.FR.01		A Charging Station Connector MUST have one of the valid statuses from the ConnectorStatus enumeration.
G01.FR.02	When an EVSE is set to status <i>Unavailable</i> by a ChangeAvailabilityRequest message.	The EVSE's <i>Unavailable</i> status SHALL be persistent across reboots.

G02 - Heartbeat

Table 138. G02 - Heartbeat

No.	Type	Description
1	Name	Heartbeat
2	ID	G02
	Functional block	G. Availability
3	Objective(s)	To let the CSMS know that a Charging Station is still connected, optionally the Heartbeat can be used for time synchronisation.
4	Description	This use case describes a way to let the CSMS know the Charging Station is still connected, a Charging Station sends a heartbeat after a configurable time interval. Depending on the configuration the Heartbeat can be used for time synchronisation.
	Actors	Charging Station, CSMS
	Scenario description	<ol style="list-style-type: none"> 1. If there is no activity for a certain time, the Charging Station sends HeartbeatRequest for ensuring that the CSMS knows that a Charging Station is still alive. 2. Upon receipt of HeartbeatRequest, the CSMS responds with HeartbeatResponse. The response message contains the current time of the CSMS, which the Charging Station MAY use to synchronize its internal clock.
5	Prerequisite(s)	The heartbeat interval is set.
6	Postcondition(s)	<p>Successful postconditions:: The CSMS knows the Charging Station is still connected.</p> <p>Failure postconditions: The CSMS concludes that the Charging Station is <i>Offline</i>.</p>

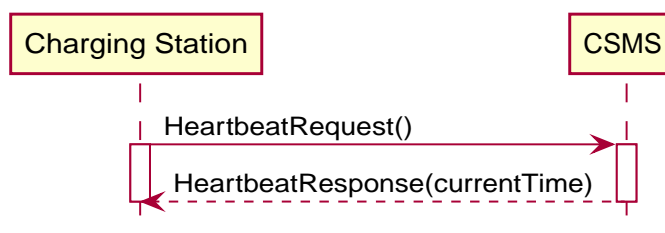


Figure 73. Sequence Diagram: Heartbeat

7	Error handling	n/a
8	Remark(s)	With JSON over WebSocket, sending heartbeats is <i>not</i> instrumental to keeping websockets alive, since websockets already provide a mechanism for this. However, if the Charging Station uses the heartbeat for time synchronization, it is advised to at least send one heartbeat per 24 hours.

G02 - Heartbeat - Requirements

Table 139. G02 - Requirements

ID	Precondition	Requirement definition	Note
G02.FR.01	When the CSMS responds with BootNotificationResponse with a status <i>Accepted</i> .	The Charging Station SHALL adjust the heartbeat interval in accordance with the interval from the response message.	
G02.FR.02		The Charging Station SHALL send HeartbeatRequest after a configurable time interval.	To ensure that the CSMS knows that a Charging Station is still alive.
G02.FR.03		The HeartbeatResponse message SHALL contain the current time of the CSMS.	
G02.FR.04	Whenever a message from a Charging Station has been received.	The CSMS SHALL assume availability of that Charging Station.	
G02.FR.05		It is RECOMMENDED that the Charging Station resets its heartbeat interval timer when another message has been sent to the CSMS.	

ID	Precondition	Requirement definition	Note
G02.FR.06	When the Charging Station receives a HeartbeatResponse .	It is RECOMMENDED that the Charging Station uses the current time to synchronize its internal clock.	
G02.FR.07	When the heartbeat interval timer is continuously reset because of continuous sending of messages AND HeartbeatRequest is used for time synchronisation	It is RECOMMENDED that the Charging Station sends a HeartbeatRequest at least once every 24 hours to synchronise the clock.	

G03 - Change Availability EVSE/Connector

Table 140. G03 - Change Availability EVSE/Connector

No.	Type	Description
1	Name	Change Availability EVSE/Connector
2	ID	G03
	Functional block	G. Availability
3	Objective(s)	To enable the CSMS to change the availability of an EVSE or Connector to <i>Operative</i> or <i>Inoperative</i> .
4	Description	This use case covers how the CSMS requests the Charging Station to change the availability of one of the EVSEs or Connectors to <i>Operative</i> or <i>Inoperative</i> . An EVSE/Connector is considered <i>Operative</i> in any status other than <i>Faulted</i> and <i>Unavailable</i> .
	Actors	Charging Station, CSMS
	Scenario description	<ol style="list-style-type: none"> 1. The CSMS sends ChangeAvailabilityRequest requesting a Charging Station to change the availability of an EVSE or Connector. 2. The Charging Station changes the availability to the EVSE/Connector to the requested AvailabilityType from the ChangeAvailabilityRequest. 3. Upon receipt of ChangeAvailabilityRequest, the Charging Station responds with ChangeAvailabilityResponse. In case that the status 'Scheduled' is reported in the ChangeAvailabilityResponse, a transaction was running and this will be finished first. 4. The Charging Station reports the status of the EVSE/Connector using a StatusNotification.
	Alternative scenario(s)	G04 - Change Availability Charging Station
5	Prerequisite(s)	n/a
6	Postcondition(s)	<p>Successful postcondition: When changing the availability of an EVSE/Connector to <i>Operative</i>, the status of the EVSE has changed to <i>Available</i>, <i>Occupied</i> or <i>Reserved</i>. When changing the availability of an EVSE/Connector to <i>Inoperative</i>, the status of the EVSE has changed to <i>Unavailable</i>.</p> <p>Failure postcondition: The status of the EVSE is as it was just before the Charging Station received ChangeAvailabilityRequest and not according to the requested Availability.</p>

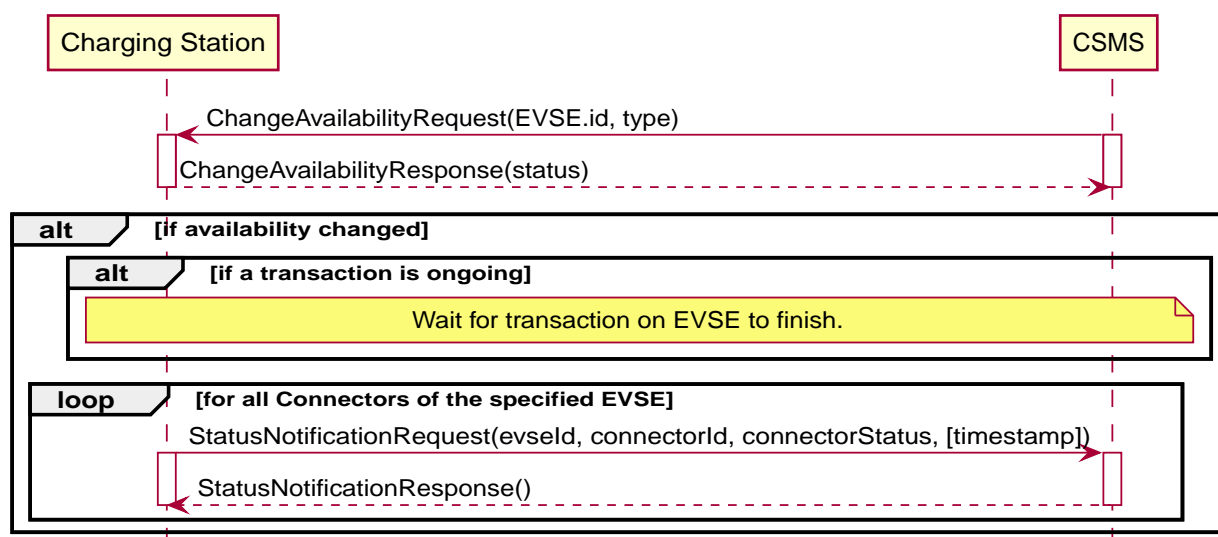


Figure 74. Sequence Diagram: Change Availability

7	Error handling	n/a
8	Remark(s)	Persistent states, for example: EVSE set to <i>Available</i> SHALL persist a reboot.

G03 - Change Availability EVSE - Requirements

Table 141. G03 - Requirements

ID	Precondition	Requirement definition	Note
G03.FR.01	Upon receipt of ChangeAvailabilityRequest .	The Charging Station SHALL respond with ChangeAvailabilityResponse .	
G03.FR.02	G03.FR.01	This response message SHALL indicate whether the Charging Station is able to change to the requested availability.	
G03.FR.03	In the event that CSMS requests the Charging Station to change an EVSE to the state it is already in.	The Charging Station SHALL respond with availability status <i>Accepted</i> .	
G03.FR.04	When an availability change request with ChangeAvailabilityRequest has happened.	The Charging Station SHALL inform the CSMS of its new availability status with StatusNotificationRequest .	As described in ChangeAvailabilityStatusEnumType
G03.FR.05	When a transaction is in progress.	The Charging Station SHALL respond with availability status <i>Scheduled</i> to indicate that it is scheduled to occur after the transaction has finished.	
G03.FR.06	When the availability of an EVSE becomes Inoperative (<i>Unavailable</i> , <i>Faulted</i>)	All operative connectors (i.e. not <i>Faulted</i>) of that EVSE SHALL become <i>Unavailable</i> .	
G03.FR.07	When the availability of an EVSE becomes Operative	The Charging Station SHALL revert the status of all connectors of that EVSE to their original status.	See Note 1.
G03.FR.08	When the availability of an EVSE or Connector has been set explicitly via ChangeAvailabilityRequest	The set availability state SHALL be persistent across reboot/power loss.	

NOTE 1. The Charging Station, EVSEs and Connectors have separate / individual states. This means (for example) that when setting a connector to Inoperative, then setting the connected EVSE to Inoperative and thereafter change the EVSE back to operative, the connector will remain Inoperative.

NOTE 2. It is only required to report a status change of a connector. StatusNotificationRequest only supports the reporting of connector statuses.

G04 - Change Availability Charging Station

Table 142. G04 - Change Availability Charging Station

No.	Type	Description
1	Name	Change Availability Charging Station
2	ID	G04
	Functional block	G. Availability
	Parent use case	G03 - Change Availability EVSE/Connector
3	Objective(s)	To enable the CSMS to change the availability of a Charging Station.
4	Description	<p>This use case describes how the CSMS requests the Charging Station to change the availability.</p> <p>A Charging Station is considered <i>Operative</i> when it is charging or ready for charging.</p> <p>A Charging Station is considered <i>Inoperative</i> when it does <i>not</i> allow any charging.</p>
	Actors	Charging Station, CSMS
	Scenario description	<ol style="list-style-type: none"> 1. The CSMS sends a ChangeAvailabilityRequest for requesting a Charging Station to change its availability. 2. Upon receipt of a ChangeAvailabilityRequest, the Charging Station responds with ChangeAvailabilityResponse.
5	Prerequisite(s)	n/a
6	Postcondition(s)	<p>Successful postcondition:</p> <p>The CSMS was able to change the availability of the Charging Station.</p> <p>When changing the availability of a Charging Station to <i>Operative</i>, the status of the Charging Station has changed to <i>Available</i>.</p> <p>When changing the availability of a Charging Station to <i>Inoperative</i>, the status of the Charging Station has changed to <i>Unavailable</i>.</p> <p>Failure postcondition:</p> <p>The CSMS was <i>not</i> able to change the requested Charging Station's availability.</p>

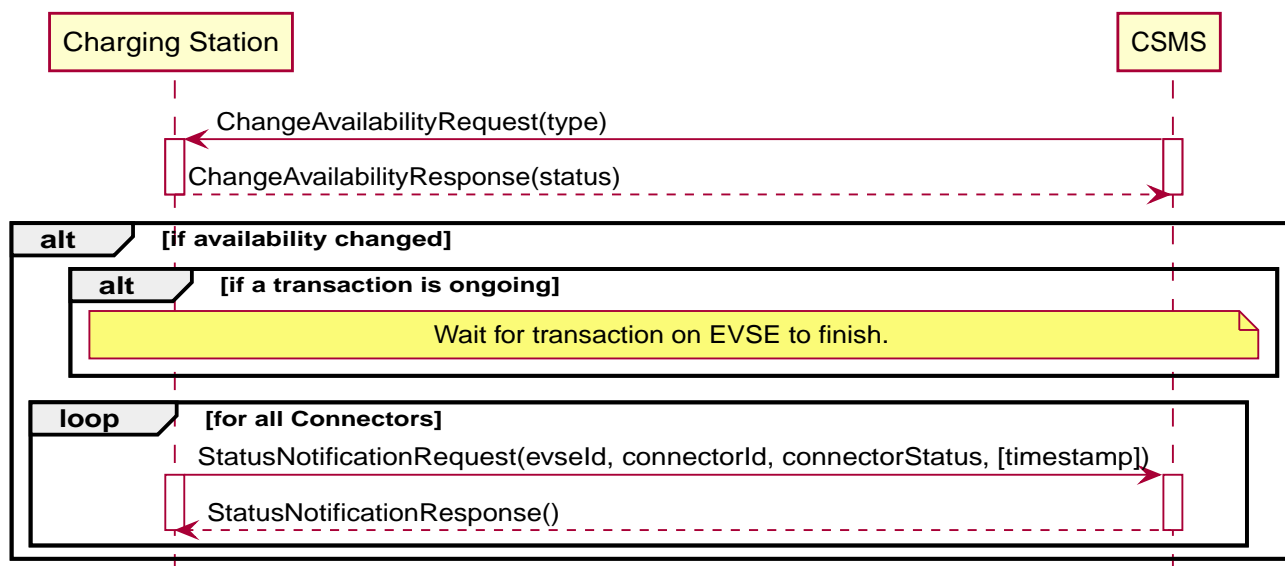


Figure 75. Sequence Diagram: Change Availability Charging Station

7	Error handling	n/a
8	Remark(s)	Persistent states: for example, Charging Station set to <i>Unavailable</i> SHALL persist a reboot.

G04 - Change Availability Charging Station - Requirements

Table 143. G04 - Requirements

ID	Precondition	Requirement definition	Note
G04.FR.01	In the case the evse field is omitted in ChangeAvailabilityRequest .	The Charging Station status change SHALL apply to the whole Charging Station.	
G04.FR.02	Upon receipt of ChangeAvailabilityRequest .	The Charging Station SHALL respond with ChangeAvailabilityResponse .	
G04.FR.03	G04.FR.02	This response message SHALL indicate whether the Charging Station is able to change to the requested availability.	
G04.FR.04	In the event that CSMS requests the Charging Station to change to the state it is already in.	The Charging Station SHALL respond with availability status <i>Accepted</i> .	
G04.FR.05	When an availability change request with ChangeAvailabilityRequest has happened.	The Charging Station SHALL inform the CSMS by sending the status of each of the changed connectors via a StatusNotificationRequest	As described in ConnectorStatusEnumType
G04.FR.06	When a transaction is in progress.	The Charging Station SHALL respond with availability status <i>Scheduled</i> to indicate that it is scheduled to occur after the transaction has finished.	
G04.FR.07	When the availability of the Charging Station becomes Inoperative (<i>Unavailable, Faulted</i>)	All operative EVSEs and connectors (i.e. not <i>Faulted</i>) SHALL become <i>Unavailable</i> .	
G04.FR.08	When the availability of the Charging Station becomes Operative	The Charging Station SHALL revert the status of all EVSEs and connectors to their original status.	See Note 1.
G04.FR.09	When the availability of a Charging Station has been set explicitly via ChangeAvailabilityRequest	The set availability state SHALL be persistent across reboot/power loss.	

NOTE

1. The Charging Station, EVSEs and Connectors have separate / individual states. This means (for example) that when setting a connector to Inoperative, then setting the connected EVSE to Inoperative and thereafter change the EVSE back to operative, the connector will remain Inoperative.

NOTE

2. It is only required to report a status change of a connector. StatusNotificationRequest only supports the reporting of connector statuses.

G05 - Lock Failure

Table 144. G05 - Lock Failure

No.	Type	Description
1	Name	Lock Failure
2	ID	G05
	Functional block	G. Availability
3	Objective(s)	To prevent the EV Driver from charging while the Connector is not properly locked.
4	Description	This use case describes how the EV Driver is prevented from starting a charge session at the Charging Station while the Connector is not locked properly.
	Actors	Charging Station, CSMS, EV Driver
	Scenario description	<ol style="list-style-type: none"> 1. The EV Driver is authorized by the Charging Station and/or CSMS. 2. The lock Connector attempt fails. 3. A NotifyEventRequest for the ConnectorPlugRetentionLock component, variable = Problem, value = true.
5	Prerequisite(s)	Charging Cable plugged in (status = <i>Occupied</i>) Charging Station has the ConnectorPlugRetentionLock component defined in its Device Model. MonitoringLevel is set to a level that a connector lock event failure will be reported.
6	Postcondition(s)	Transaction is not started and connector lock event failure is reported.

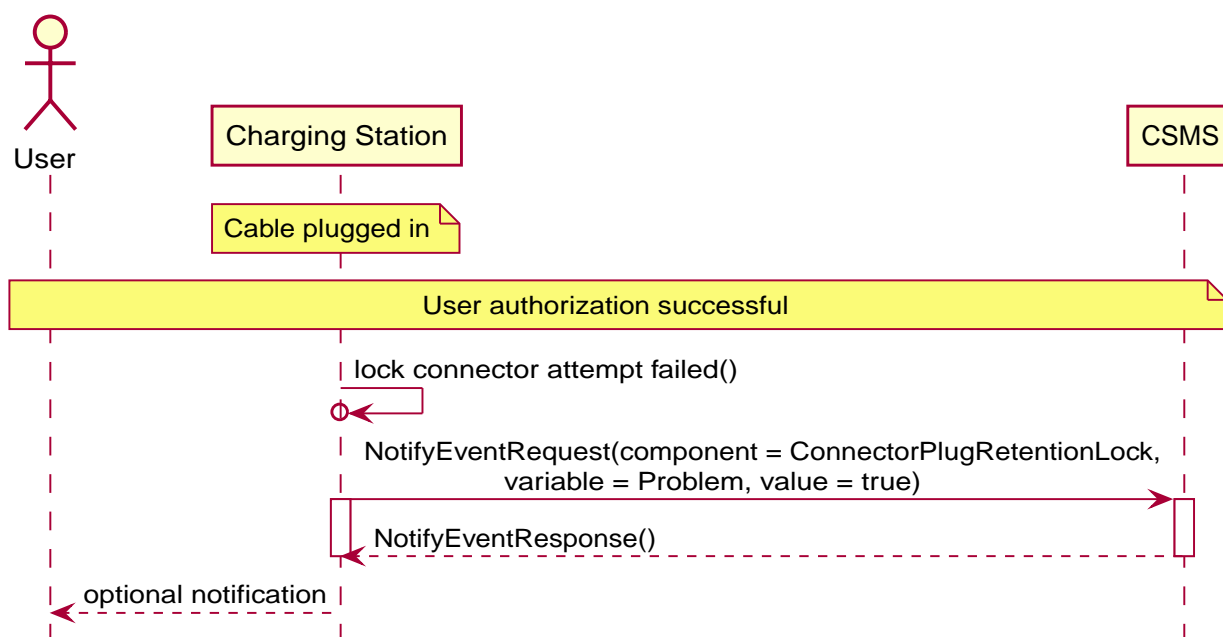


Figure 76. Sequence Diagram: Lock Failure

7	Error handling	n/a
8	Remark(s)	It is advisable to provide some sort of notification to the EV Driver ("cable cannot be locked").

G05 - Lock Failure - Requirements

Table 145. G05 - Requirements

ID	Precondition	Requirement definition	Note
G05.FR.01	If the locking of the connector retention lock fails.	The Charging Station SHALL NOT start charging.	
G05.FR.02	G05.FR.01	The Charging Station SHALL send a NotifyEventRequest to the CSMS for the <i>ConnectorPlugRetentionLock</i> component with variable = Problem, Value = True.	
G05.FR.03	G05.FR.02	The CSMS SHALL respond with a NotifyEventResponse .	

ID	Precondition	Requirement definition	Note
G05.FR.04	G05.FR.01	The Charging Station MAY show an optional notification to the EV Driver.	To notify the EV driver of the lock failure.