Smart charger cabinets

MQTT protocol proposal

v0.6

**Voltz Motors**

**2021**

Version Record:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Serial number | Protocol number | Version number | Modify the content | Modifier | Update time |
| 1 | V101 | V101 |  |  |  |
| 2 | V101 | V101 | Revise:   1. Added"Events notification" topic key: value in Event 2. Blue mark used |  |  |
| 3 | V101 | V101 | Revise:  1.Revise MQTT's BMS information content based on BMS information |  |  |
| 4 | V101 | V101 | Revise:  1.Sample error change |  |  |
| 5 | V101 | V101 | Revise:  1.Add soc in “notification” |  |  |
| 6 | V101 | V102 | Revise:  1. Add threshold configuration topic publication and threshold configuration subscription response |  |  |

Emphasize:

1. MQTT protocol support version

V3.1/V3.1.1

1. QoS class：2

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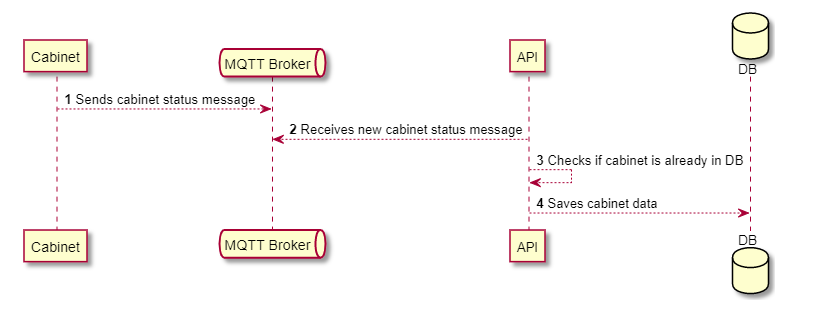
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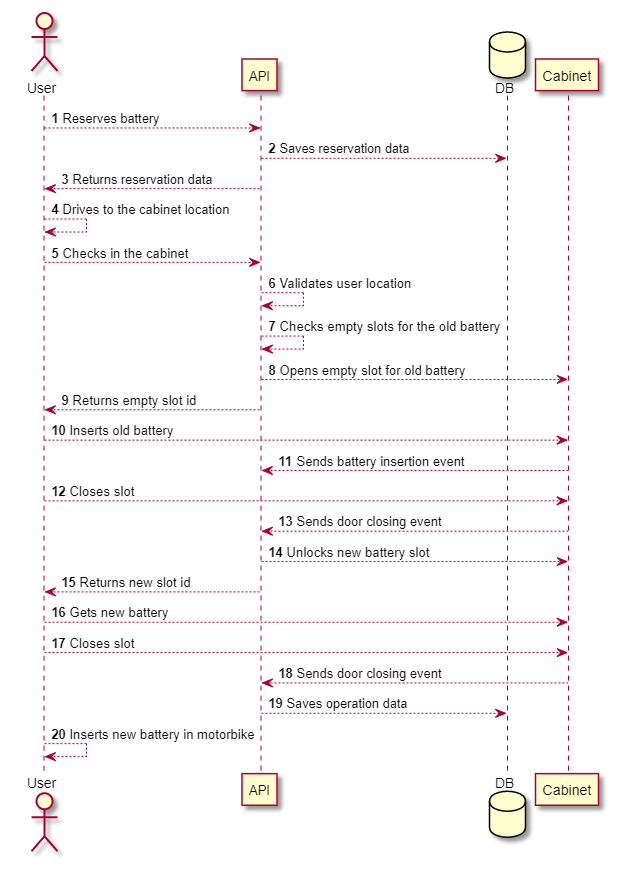
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# Workflow representation

## 1.1. Sequence diagram for the process of saving cabinets data to our database

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## 1.2. Sequence diagram for the battery swapping operation

****

# Topics description

## 2.1. Cabinet information

Topic where the cabinet will send the complete status of the cabinet and the batteries inside of it every 30s and after a new battery is inserted or removed from one of the slots.

**topic:** /stations/info/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| mac\_addr | String | cabinet’s mac address |
| device\_id | String | Device ID |
| coordinates | String | cabinet’s location (longitude, latitude) |
| ctr\_pro | String | Ctr Board Protocol |
| ctr\_softver | String | Ctr Board Software version |
| ctr\_warning | BOOL | true:cabinet exist warning false:No warning |
| env\_temperature | Integer | Environment temperature |
| total\_slots | Integer | Total slots in cabinet |
| empty\_slots | Integer | Total empty slots in cabinet |
| slots | List<Slot> | Information about individual slots (3.1. Slot description) |
| timestamp | DateTime | timestamp of message creation |

**Example:**

**{**

**"mac\_addr": "00-88-14-4D-4C-FB",**

**"**device\_id**": "2600401516050001",**

**"coordinates": "-8.06232309651, -34.8712023897282",**

**"**ctr\_pro**": "V101",**

**"**ctr\_softver**": "V101",**

**"**ctr\_warning**": false,**

**"total\_slots": 12,**

**"empty\_slots": 3,**

**"slots": [**

**{**

**"**sub\_pro**": "V101",**

**"sub\_softver": "V101",**

**"id": 1,**

**"**slot\_status**": false,**

**"sub\_Exit\_Err": false,**

**"battery": {**

**"id": "BT104802012SZHL200414313",**

**"max\_ChgVol": 725,//72.5V**

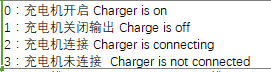
**// BMS the limited charge voltage**

**"max\_ChgCur": 900,//90.0A**

**// BMS the limitedcharge current**

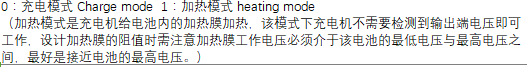
**"charger\_CtrSW": 0,//0:Charger is on**

**// the switcher of charger**



**"ctr\_WorkMode" 0,//Charge mode**

**//working mode**



**"bat\_Vol": 725,//72.5V**

**"bat\_Cur": 900,//90.0A**

**"bat\_MaxTemp": 25,**

**"bat\_MinTemp": 25,**

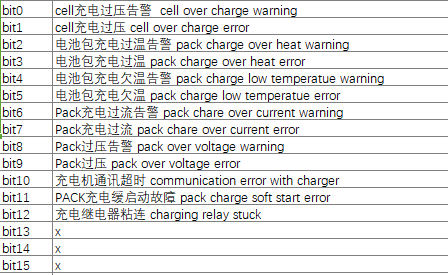
IMG_256

**"soc": 95,**

**"soh", 99,**

**"chging\_Err": 3,//0x0003 -->bit0:cell over charge warning**

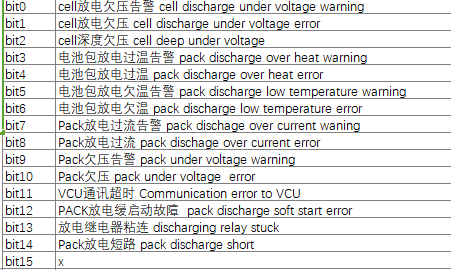
**-->bit1:cell over charge error //Charge Error**



**"disChging\_Err: 3": //0x0003-->bit0:cell discharge under voltage warning**

**-->bit1: cell discharge under voltage error**

**//Discharge Error**

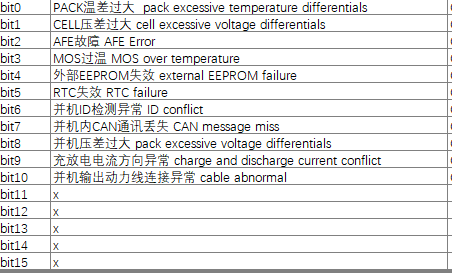


**"max\_Dischg\_Cur": 200,//20A**

**"comm\_Err" 3,//0x0003 -->bit0:pack excessive temperature differentials**

**-->bit1:cell excessive voltage differentials**

**// Common Error**



**}**

**},**

**{**

**"**sub\_pro**": "V101",**

**"sub\_softver": "V101",**

**"id": 2,**

**"** slot\_status **": false,**

**"sub\_Exit\_Err": false,**

**"battery": null**

**}**

**],**

**"timestamp": "2021-08-03 17:04:54.123Z"**

**}**

## 2.2. Open Slot

Topic where the cabinet will receive the command to open specific slots.

**topic:** /stations/open\_slot/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| slot\_id | Integer | Slot identification |
| slot\_info | integer | 0x01:empty slot  0x02:battery slot |
| order\_number | String | Order number |
| timestamp | DateTime | timestamp of message creation |

**Example:**

**{**

**"slot\_id": 1,**

**"**slot\_info**": 1,**

**"**order\_number**": "VOLTZ20210817000001",**

**"timestamp": "2021-08-03 17:04:54.123Z"**

**}**

## 2.3. Close Slot(Meaningless-->delete)

Topic where the cabinet will receive the command to close specific slots.

**topic:** base-url/cabinets/close\_slot/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| slot\_id | Integer | Slot identification |
| timestamp | DateTime | timestamp of message creation |

**Example:**

**{**

**"slot\_id": 1,**

**"timestamp": "2021-08-03 17:04:54.123Z"**

**}**

## 2.4. Events notification

Topic where the cabinet will send notifications after every action it takes (for example: closing or opening a slot).

**topic:** /stations/notifications/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| slot\_id | Integer | Slot identification |
| order\_number | String | Order number |
| event | String | name of the event. (open\_slot, close\_slot, battery\_inserted, battery\_removed,open\_slot\_busy,open\_slot\_success,open\_slot\_sub\_no\_execution,door\_err,sub\_execution\_timeout,sub\_offline,open\_empty\_slot\_bat\_Online,open\_bat\_slot\_bat\_offline,insert\_faulty\_battery,close\_empty\_no\_save\_bat,opt\_success,close\_slot\_timeout,waiting\_open\_full\_timeout) |
| battery\_id | String | Battery identification (null if the slot is empty) |
| soc | Integer | Battery soc |
| timestamp | DateTime | timestamp of message creation |

**Example:**

**{**

**"slot\_id": 1,**

**"**order\_number**": "VOLTZ20210817000001",**

**"event": "open\_slot",**

**"battery\_id": "BT104802012SZHL200414313",**

**"soc"：72,**

**"timestamp": "2021-08-03 17:04:54.123Z"**

**}**

## 2.5. Alerts

Topic where the cabinet will send alerts if it identifies any software or hardware alerts or errors.

**topic:** /stations/alerts/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| slot\_id | Integer | Slot identification (null if the alert isn’t for a specific slot) |
| type | String | message type (alert, error) |
| message | String | message describing the problem  (Error:)(cabinet\_alert:**"Lightning warning",**bat\_type\_err:**"**bat reverse connection**","**Subsequent updates for the remaining labels**";"**Internal battery failure**"**  charger\_type\_err:**"**Charger temperature is too high**","**Subsequent updates for the remaining labels**"**) |
| timestamp | DateTime | timestamp of message creation |

**Example:**

**{**

**"slot\_id": 1,**

**"type": "Error",**

**"message": "Charging failure",**

**"timestamp": "2021-08-03 17:04:54.123Z"**

**}**

## Thresholds

The topic can be used for subscription thresholds and update thresholds. It is mainly used for debugging and initial production configuration. It is not recommended to publish the topic during use, because the service will restart after receiving the topic

**topic:** /stations/thresholds/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| charge\_over\_temp\_period | Integer | charger over temperature threshold |
| bat\_over\_temp\_period | Integer | battery over temperature threshold |
| soc\_period | Integer | battery full threshold |
| charge\_time\_period | Integer | charging time threshold(min，150~720) |
| info\_up\_period | Integer | cabinet information reporting cycle |
| log\_up\_period | Integer | reporting cycle of log file to FTP server |
| ftp\_url | String | FTP server address for log upload |
| ftp\_user | String | FTP username |
| ftp\_password | String | FTP password |
| ftp\_port | Integer | FTP port |
| ftp\_remote\_dir | String | FTP server remote root |
| enable\_gzip | BOOL | Enable gzip |

**Example:**

**{**

**"charge\_over\_temp\_period": 70,**

**"bat\_over\_temp\_period": 80,**

**"soc\_period": 95,**

**"charge\_time\_period": 600,**

**"info\_up\_period": 10,**

**"log\_up\_period": 2,**

**"ftp\_url": ”192.168.0.109”,**

**"ftp\_user":”logs”,**

**"ftp\_password":”imCbe2ZHmpAEJGe”,**

**"ftp\_port": 21,**

**"ftp\_remote\_dir": "/",**

**"enable\_gzip": false**

**}**

## ThresholdsResponse

It is mainly used to confirm whether the threshold is successfully set to the cabinet

**topic:** /stations/thresholds\_response/{cabinet\_mac\_addr}

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| charge\_over\_temp\_period | BOOL | true:success false:failed |
| bat\_over\_temp\_period | BOOL | true:success false:failed |
| soc\_period | BOOL | true:success false:failed |
| charge\_time\_period | BOOL | true:success false:failed |
| info\_up\_period | BOOL | true:success false:failed |
| log\_up\_period | BOOL | true:success false:failed |
| ftp\_url | BOOL | true:success false:failed |
| ftp\_user | BOOL | true:success false:failed |
| ftp\_password | BOOL | true:success false:failed |
| ftp\_port | BOOL | true:success false:failed |
| ftp\_remote\_dir | BOOL | true:success false:failed |
| enable\_gzip | BOOL | true:success false:failed |

**Example:**

**{**

**"charge\_over\_temp\_period":true,**

**"bat\_over\_temp\_period":true,**

**"soc\_period":true,**

**"charge\_time\_period":true,**

**"info\_up\_period":true,**

**"log\_up\_period":true,**

**"ftp\_url":true,**

**"ftp\_user":true,**

**"ftp\_password":true,**

**"ftp\_port":true,**

**"ftp\_remote\_dir":true,**

**"enable\_gzip":true**

**}**

# Extra information

## 3.1. Slot description

|  |  |  |
| --- | --- | --- |
| **Field name** | **Type** | **Description** |
| sub\_pro | String | Sub Board Protocol |
| sub\_softver | String | Sub Board Software version |
| id | Integer | Slot identification |
| **sub\_Exit\_Err** | BOOL | true:sub exist warning false:No warning |
| battery | Battery | Battery complete information |
| slot\_status | Intger | 0：close 1：open 2：fault |

# Questions to the supplier

1. Do the cabinets have a unique ID other than the Mac Address?

**NOTE:**