

# FlexAPI Reference

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*For VT3 series*

## Revision History

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| Revision | Date      | Author | Item(s) changed                                                              | Note |
|----------|-----------|--------|------------------------------------------------------------------------------|------|
| 1.0.1    | 8/2/2021  | Liyb   | Created this document based on<br><FlexAPI_Reference_for_3rd_party_platform> |      |
| 1.0.2    | 18/1/2022 | Liyb   | Added ID description for OBD parameters.                                     |      |
| 1.0.3    | 20/1/2022 | Tianmh | Added Sensor parameters and W2R parameters.                                  |      |

# 1. Introduction

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We introduced FlexAPI for the fast evolving IoT applications, which highly value easy integration, openness, flexibility, extensibility and programmability.

FlexAPI is designed to be efficient, clean and ready to use. It's network oriented and programming language independent, and is ideal for cloud platform integration.

FlexAPI provides unified data and control services via MQTT topics for 3rd party platforms.

For data service, each MQTT topic corresponds to a group of data, and we have ready to use reserved groups such as: GNSS, OBD, Motion, IO ,cellular,sensor, modbus(w2r).

Besides, user can use sysinfo group to obtain device basic information.

In general, reserved groups are enough for user's need.

Users can subscribe to these topics to get the latest data, and they can also set the data uploading intervals.

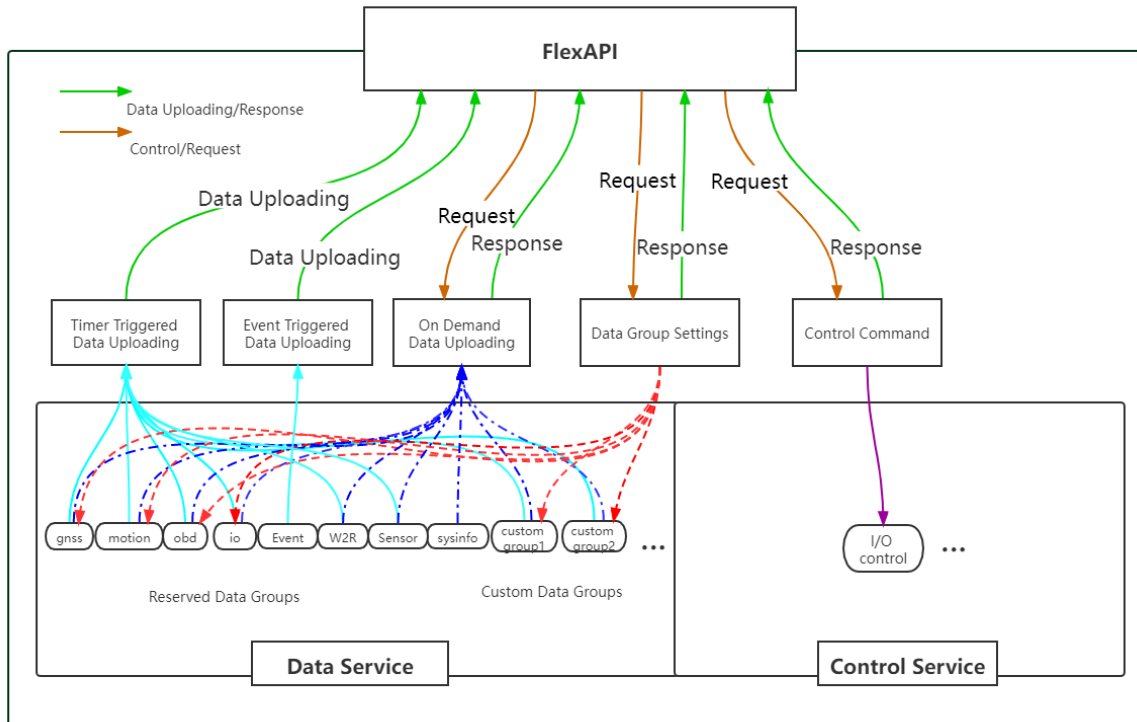
FlexAPI specially provides MQTT topics for users to actively get data on demand.

For advanced users, they can even define their interested groups and set their uploading intervals.

We employ a request & response scheme for user initiated service requests.

Request & response scheme means users need to subscribe to the response topics, and they request service by publishing a message to the request topics.

## 1.1 Architecture



## 1.2 MQTT Intro

MQTT is a widely adopted, lightweight messaging protocol designed for constrained devices.

Our MQTT implementation is based on MQTT version 3.1.1, and supports QoS 0 and 1.

For more information, see [MQTT](#).

## 1.3 MQTT Server Settings

### 1.3.1 MQTT Server Address and Port.

FlexAPI needs remote MQTT broker address and port to connect to.

### 1.3.2 MQTT Authentication

#### 1.3.2.1 Username/Password(Default)

FlexAPI needs username and password for authentication.

After network connection is established, FlexAPI will send MQTT CONNECT Control Packet to remote MQTT broker.

The payload must contain Username, Password and `unique` Client Identifier fields. see [MQTT CONNECT](#).

FlexAPI will use `unique` Client Identifier `{client_id}` as part of MQTT topics. see [FlexAPI supported Topics](#).

## 2 FlexAPI Overview

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FlexAPI organizes data as groups and provides ready to use reserved groups for users to develop their applications.

FlexAPI allow users to change reserved and custom group settings.

Users can get timer triggered group data periodically and event triggered data. Besides, FlexAPI also allow users to actively get group data on demand.

For user initiated service requests we employ a request & response scheme.

Request & response scheme means users need to subscribe to the response topics, and they request service by publishing a message to the request topics.

This overview part gives summary on: FlexAPI general information, error codes and supported topics.

For Basic Usage, see [3. Basic usage](#).

For Advanced Usage, see [4. Advanced usage](#).

For FlexAPI supported Parameters, see [Appendix A. FlexAPI supported Parameters](#).

## 2.1 FlexAPI Return Information and Errors

### 2.1.1 General Information

| Parameter Name | Description       | Type   | Note                                                                                                                                                                                                          |
|----------------|-------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| client_token   | client token      | string | A unique string for users to match responses with the corresponding requests.                                                                                                                                 |
| result         | result            | object | When the request succeeds, there will be result field in response message body.<br>API callers should check the content of the result field to determine whether the request has been successfully processed. |
| error          | error code        | string | When the request fails, it is added to the response message body.<br>For more information, see <a href="#">General Error Codes</a>                                                                            |
| error_desc     | error description | string | When the request fails, it is added to the response message body.<br>For more information, see <a href="#">General Error Codes</a>                                                                            |
| ts             | time stamp        | number | UNIX timestamp since Epoch. Indicates when the message was transmitted by device.                                                                                                                             |

### 2.1.2 General Error Codes

| Error Code        | Description           | Error Handling                                   |
|-------------------|-----------------------|--------------------------------------------------|
| auth_failed       | authentication failed | check username and password                      |
| invalid_parameter | invalid parameter     | check request parameter                          |
| not_found         | resource not exist    | make sure related service is enabled and running |
| device_busy       | device busy           | retry request                                    |
| device_error      | device internal error | retry request                                    |
| data_invalid      | resource invalid      | retry request                                    |

## 2.2 FlexAPI Supported Topics

### 2.2.1 Data Service

#### 2.2.1.1 Timer Triggered Reserved Group Data Get

#### FlexAPI Reference

*For VT3 series*

Revision History

1. Introduction

1.1 Architecture

1.2 MQTT Intro

1.3 MQTT Server Settings

1.3.1 MQTT Server Address and Port.

1.3.2 MQTT Authentication

1.3.2.1 Username/Password(Default)

2 FlexAPI Overview

2.1 FlexAPI Return Information and Errors

2.1.1 General Information

2.1.2 General Error Codes

2.2 FlexAPI Supported Topics

2.2.1 Data Service

2.2.1.1 Timer Triggered Reserved Group Data Get

2.2.1.2 Reserved Group Settings

2.2.1.3 On Demand Reserved Group Data Get

2.2.2 Control Service

2.2.2.1 IO Control

2.2.3 Advanced Usage

2.2.3.1 Custom Group Settings

2.2.3.1.1 Create/Update Custom Group

2.2.3.1.2 Get Custom Group Settings

2.2.3.2 Timer Triggered Custom Group Data Get

2.2.3.3 On Demand Custom Group Data Get

2.3 FlexAPI Limits

3. Basic Usage

3.1 Timer Triggered Reserved Group Data Get

3.1.1 OBD Data

3.1.2 GNSS Data

3.1.3 Motion Data

3.1.4 IO Data

3.1.5 Cellular1 Data

3.1.5 Sensor Data

3.1.6 W2R Data

3.2 Reserved Group Settings

3.2.1 General Settings

3.2.3 OBD Settings

3.2.4 GNSS Settings

3.2.5 Motion Settings

3.2.6 IO Settings

3.2.7 Cellular1 Settings

3.3 On Demand Reserved Group Information Get

3.3.1 OBD Data

3.3.3 GNSS Data

3.3.4 Motion Data

3.3.5 IO Data

3.3.6 Cellular1 Data

3.3.7 System Info

- 3.4 Control Service
  - 3.4.1 IO Control
- 4. Advanced Usage
  - 4.1 Custom Group Settings
    - 4.1.1 Create/Update Custom Group
    - 4.1.2 Get Custom Group Settings
  - 4.2 Timer Triggered Custom Group Data Get
  - 4.3 On Demand Custom Group Data Get
- 5. Event Service
  - 5.1 Event Level
  - 5.2 Event Types
    - 5.2.1 General event Types
    - 5.2.2 DTC event Types
  - 5.3 Event parameters
  - 5.4 Event examples
    - 5.4.1 General event
    - 5.4.3 DTC event
      - 5.4.3.1 OBD-II DTC
      - 5.4.3.2 J1939 DTC
- Appendix A. FlexAPI Supported Parameters
  - A.1 GNSS Parameters
  - A.2 Motion Parameters
  - A.3 IO Parameters
  - A.4 OBD Parameters
  - A.5 Cellular Parameters
  - A.6 System Parameters
  - A.7 Sensor Parameters
  - A.8 W2R Parameters

When using generic MQTT broker, users can subscribe to the following topics listed with **Topic for generic MQTT broker** to get the latest data.

*Note: The **properties for Azure IoT Hub** is only for users using Azure IoT Hub.*

| Topic for generic MQTT broker | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                                       |
|-------------------------------|------------------------------------------|-----------------|-----------------------------------------------------------------------------------|
| v1/{client_id}/obd/info       | group:obd<br>type:info                   | Device to Cloud | Timer triggered OBD data uploading.<br>See <a href="#">OBD data</a> .             |
| v1/{client_id}/gnss/info      | group:gnss<br>type:info                  | Device to Cloud | Timer triggered GNSS data uploading.<br>see <a href="#">GNSS Data</a> .           |
| v1/{client_id}/motion/info    | group:motion<br>type:info                | Device to Cloud | Timer triggered Motion data uploading.<br>see <a href="#">Motion Data</a> .       |
| v1/{client_id}/io/info        | group:io<br>type:info                    | Device to Cloud | Timer triggered IO data uploading.<br>see <a href="#">IO Data</a> .               |
| v1/{client_id}/cellular1/info | group:cellular1<br>type:info             | Device to Cloud | Timer triggered Cellular1 data uploading.<br>see <a href="#">Cellular1 Data</a> . |
| v1/{client_id}/sensor/info    | group:sensor<br>type:info                | Device to Cloud |                                                                                   |
| v1/{client_id}/w2r/info       | group:w2r<br>type:info                   | Device to Cloud |                                                                                   |

### 2.2.1.2 Reserved Group Settings

Users can use the following topics to set the data uploading intervals and define their interested data.

*Note: The **properties for Azure IoT Hub** is only for users using Azure IoT Hub.*

| Topic for generic MQTT broker     | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                              |
|-----------------------------------|------------------------------------------|-----------------|--------------------------------------------------------------------------|
| v1/{client_id}/obd/set            | group:obd<br>cmd:set                     | Cloud to Device | Set OBD group request.<br>see <a href="#">OBD settings</a> .             |
| v1/{client_id}/obd/set/resp       | group:obd<br>type:setRsp                 | Device to Cloud | Set OBD group response.                                                  |
| v1/{client_id}/gnss/set           | group:gnss<br>cmd:set                    | Cloud to Device | Set GNSS group request.<br>see <a href="#">GNSS settings</a> .           |
| v1/{client_id}/gnss/set/resp      | group:gnss<br>type:setRsp                | Device to Cloud | Set GNSS group response.                                                 |
| v1/{client_id}/motion/set         | group:motion<br>cmd:set                  | Cloud to Device | Set Motion group request.<br>see <a href="#">Motion settings</a> .       |
| v1/{client_id}/motion/set/resp    | group:motion<br>type:setRsp              | Device to Cloud | Set Motion group response.                                               |
| v1/{client_id}/io/set             | group:io<br>cmd:set                      | Cloud to Device | Set IO group request.<br>see <a href="#">IO settings</a> .               |
| v1/{client_id}/io/set/resp        | group:io<br>type:setRsp                  | Device to Cloud | Set IO group response.                                                   |
| v1/{client_id}/cellular1/set      | group:cellular1<br>cmd:set               | Cloud to Device | Set Cellular1 group request.<br>see <a href="#">Cellular1 settings</a> . |
| v1/{client_id}/cellular1/set/resp | group:cellular1<br>type:setRsp           | Device to Cloud | Set Cellular1 group response.                                            |

### 2.2.1.3 On Demand Reserved Group Data Get

Users can use the following topics to actively get data on demand.

*Note: The **properties for Azure IoT Hub** is only for users using Azure IoT Hub.*

| Topic for generic MQTT broker         | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                          |
|---------------------------------------|------------------------------------------|-----------------|----------------------------------------------------------------------|
| v1/{client_id}/obd/refresh            | group:obd<br>cmd:refresh                 | Cloud to Device | Refresh OBD data request. see <a href="#">OBD data</a> .             |
| v1/{client_id}/obd/refresh/resp       | group:obd<br>type:refresh                | Device to Cloud | Refresh OBD data response.                                           |
| v1/{client_id}/gnss/refresh           | group:gnss<br>cmd:refresh                | Cloud to Device | Refresh GNSS data request. see <a href="#">GNSS Data</a> .           |
| v1/{client_id}/gnss/refresh/resp      | group:gnss<br>type:refresh               | Device to Cloud | Refresh GNSS data response.                                          |
| v1/{client_id}/motion/refresh         | group:motion<br>cmd:refresh              | Cloud to Device | Refresh Motion data request. see <a href="#">Motion Data</a> .       |
| v1/{client_id}/motion/refresh/resp    | group:motion<br>type:refresh             | Device to Cloud | Refresh Motion data response.                                        |
| v1/{client_id}/io/refresh             | group:io<br>cmd:refresh                  | Cloud to Device | Refresh IO data request. see <a href="#">IO Data</a> .               |
| v1/{client_id}/io/refresh/resp        | group:io<br>type:refresh                 | Device to Cloud | Refresh IO data response.                                            |
| v1/{client_id}/cellular1/refresh      | group:cellular1<br>cmd:refresh           | Cloud to Device | Refresh Cellular1 data request. see <a href="#">Cellular1 Data</a> . |
| v1/{client_id}/cellular1/refresh/resp | group:cellular1<br>type:refresh          | Device to Cloud | Refresh Cellular1 data response.                                     |
| v1/{client_id}/sysinfo/refresh        | group:sysinfo<br>cmd:refresh             | Cloud to Device | Refresh system info request. see <a href="#">System Info</a> .       |
| v1/{client_id}/sysinfo/refresh/resp   | group:sysinfo<br>type:refresh            | Device to Cloud | Refresh system info response.                                        |

## 2.2.2 Control Service

### 2.2.2.1 IO Control

Users can use the following topics to turn on/off the digital output.

*Note: The **properties for Azure IoT Hub** is only for users using Azure IoT Hub.*

| Topic for generic MQTT broker  | properties for Azure IoT Hub (key:value) | Data direction  | Description                                             |
|--------------------------------|------------------------------------------|-----------------|---------------------------------------------------------|
| v1/{client_id}/io/control      | group:io<br>cmd:control                  | Cloud to Device | IO control request.<br>see <a href="#">IO Control</a> . |
| v1/{client_id}/io/control/resp | group:io<br>type:controlRsp              | Device to Cloud | IO control response.                                    |

## 2.2.3 Advanced Usage

Advanced users can use the following topics to define their interested groups and set their uploading intervals.

*Note: The **properties for Azure IoT Hub** is only for users using Azure IoT Hub.*

### 2.2.3.1 Custom Group Settings

#### 2.2.3.1.1 Create/Update Custom Group

| Topic for generic MQTT broker | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                                      |
|-------------------------------|------------------------------------------|-----------------|----------------------------------------------------------------------------------|
| v1/{client_id}/group/set      | group:group<br>cmd:set                   | Cloud to Device | Create/Update group request.<br>see <a href="#">Create/Update custom group</a> . |
| v1/{client_id}/group/set/resp | group:group<br>type:setRsp               | Device to Cloud | Create/Update group response.                                                    |

#### 2.2.3.1.2 Get Custom Group Settings

| Topic for generic MQTT broker | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                                    |
|-------------------------------|------------------------------------------|-----------------|--------------------------------------------------------------------------------|
| v1/{client_id}/group/get      | group:group<br>cmd:get                   | Cloud to Device | Get group settings request.<br>see <a href="#">Get custom group settings</a> . |
| v1/{client_id}/group/get/resp | group:group<br>type:getRsp               | Device to Cloud | Get group settings response.                                                   |

### 2.2.3.2 Timer Triggered Custom Group Data Get

| Topic for generic MQTT broker    | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                                                                 |
|----------------------------------|------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------|
| v1/{client_id}/{group_name}/info | group:<br>{group_name}<br>type:info      | Device to Cloud | Timer triggered custom group data uploading.<br>see <a href="#">Timer triggered custom group data get</a> . |

### 2.2.3.3 On Demand Custom Group Data Get

| Topic for generic MQTT broker            | properties for Azure IoT Hub (key:value) | Data direction  | Description                                                                          |
|------------------------------------------|------------------------------------------|-----------------|--------------------------------------------------------------------------------------|
| v1/{client_id}/{group_name}/refresh      | group:<br>{group_name}<br>cmd:refresh    | Cloud to Device | Refresh group data request.<br>see <a href="#">On demand custom group data get</a> . |
| v1/{client_id}/{group_name}/refresh/resp | group:<br>{group_name}<br>type:refresh   | Device to Cloud | Refresh group data response.                                                         |

## 2.3 FlexAPI Limits

| Resource                                                                                           | Limit                              |
|----------------------------------------------------------------------------------------------------|------------------------------------|
| Minimum retry interval of <code>settings</code> , <code>refresh</code> , <code>get</code> requests | 3 s                                |
| Minimum retry interval of <code>io_control</code> request                                          | 5 s                                |
| <code>client_id</code> size                                                                        | SN of VT3 series                   |
| <code>client_token</code> size                                                                     | up to 32 bytes of arbitrary string |
| Available custom groups                                                                            | up to 8                            |
| Maximum data items per group                                                                       | 32                                 |

## 3. Basic Usage

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### 3.1 Timer Triggered Reserved Group Data Get

#### 3.1.1 OBD Data

Once you have subscribed to this topic, you will periodically receive the related data.

**Topic:** `v1/{client_id}/obd/info`

**Payload:**

```
{
  "obd.ts" : 1592820539,
  "obd.rpm" : 1234,
  "obd.speed" : 20
}
```

Parameter description, See [General Information](#) & [OBD Parameters](#).

Use [OBD settings](#) to modify group setting( `interval` & `interest` ).

#### 3.1.2 GNSS Data

Once you have subscribed to this topic, you will periodically receive the related data.

**Topic:** `v1/{client_id}/gnss/info`

**Payload:**

```
{
  "gnss.ts" : 1592820539,
  "gnss.latitude": 40.232213,
  "gnss.longitude": 116.34366,
  "gnss.altitude": 346.0,
  "gnss.speed": 87.6,
  "gnss.heading": 234.0,
  "gnss.hdop": 1.2,
  "gnss.fix": 3,
  "gnss.num_sv": 7
}
```

Parameter description, See [General Information](#) & [GNSS Parameters](#).

Use [GNSS settings](#) to modify group setting( `interval` & `interest` ).

### 3.1.3 Motion Data

Once you have subscribed to this topic, you will periodically receive the related data.

**Topic:** `v1/{client_id}/motion/info`

**Payload:**

```
{
  "motion.ts": 1592820539,
  "motion.ax": 0.08,
  "motion.ay": 0.0,
  "motion.az": 0.0,
  "motion.gx": 0.15,
  "motion.gy": 0.03,
  "motion.gz": -0.47
}
```

Parameter description, See [General Information](#) & [Motion Parameters](#).

Use [Motion settings](#) to modify group setting( `interval` & `interest` ).

### 3.1.4 IO Data

Once you have subscribed to this topic, you will periodically receive the related data.

**Topic:** `v1/{client_id}/io/info`

**Payload:**

```
{
  "io.ts": 1592820539,
  "io.AI1": 0.0,
  "io.DI1": 0,
  "io.DI1_pullup": 0,
  "io.DI2": 0,
  "io.DI2_pullup": 0,
  "io.DI3": 0,
  "io.DI3_pullup": 0,
  "io.DI4": 0,
  "io.DI4_pullup": 0,
  "io.DO1": 0,
  "io.DO2": 0,
  "io.DO3": 0,
  "io.IGT": 0
}
```

Parameter description, See [General Information](#) & [IO Parameters](#).

Use [IO settings](#) to modify group setting( `interval` & `interest` ).

### 3.1.5 Cellular1 Data

Once you have subscribed to this topic, the MQTT broker will periodically receive the related data.

**Topic:** `v1/{client_id}/cellular1/info`

**Payload:**

```
{
  "modem1.ts": 1598425365,
  "modem1.imei": "862104021247207",
  "modem1.imsi": "460013231603009",
  "modem1.iccid": "89860118802836799717",
  "modem1.signal_lvl": 28,
  "modem1.reg_status": 1,
  "modem1.operator": "46001",
  "modem1.network": 3,
  "modem1.lac": "EA00",
  "modem1.cell_id": "71CF520",
  "cellular1.status": 3,
  "cellular1.ip": "10.210.255.168",
  "cellular1.netmask": "255.255.255.255",
  "cellular1.gateway": "1.1.1.3",
  "cellular1.dns1": "119.7.7.7",
  "cellular1.up_at": 1598424985
}
```

Parameter description, See [General Information](#) & [Cellular Parameters](#).

Use [Cellular settings](#) to modify group setting( `interval` & `interest` ).

### 3.1.5 Sensor Data

Once you have subscribed to this topic, the MQTT broker will periodically receive the related data.

The VT series uses group sensor to upload the data from sensors to MQTT broker. At present, only iButton/temperature sensor connected with 1-wire bus are supported.

**Topic:** `v1/{client_id}/sensor/info`

**Payload:**

```
{
  "sensor.ts" : 1642662299,
  "sensor.data" : [ {
    "type" : "1W_TP",
    "id" : "7c00000c0370db28",
    "value" : 25
  } ]
}
```

Parameter description, See [Sensor Parameters](#).

### 3.1.6 W2R Data

Once you have subscribed to this topic, the MQTT broker will periodically receive the related data. The VT series uses group W2R to upload the data from wired or wireless interface to MQTT broker. At present, **only modbus(interface: serial4) is supported**.

**Topic:** `v1/{client_id}/w2r/info`

**Payload:**

```
{
  "w2r.ts" : 1642665195,
  "w2r.if" : "serial4",
  "w2r.proto" : "modbus",
  "w2r.rmt" : [ [ 1, 3, 31, 0 ], [ 1, 3, 30, 0 ], [ 1, 3, 26, 0 ], [ 1, 3, 25, 0 ],
    [ 1, 3, 24, 0 ], [ 1, 3, 23, 0 ], [ 1, 3, 22, 0 ], [ 1, 3, 21, 0 ], [ 1, 3,
    20, 0 ], [ 1, 3, 19, 0 ], [ 1, 3, 18, 0 ], [ 1, 3, 17, 0 ], [ 1, 3, 13, 0 ], [
    1, 3, 12, 0 ], [ 1, 3, 11, 0 ], [ 1, 3, 10, 0 ], [ 1, 3, 8, 0 ], [ 1, 3, 7, 0 ],
    [ 1, 3, 5, 0 ], [ 1, 3, 4, 0 ], [ 1, 3, 3, 0 ], [ 1, 3, 2, 0 ], [ 1, 3, 1, 0 ] ]
}
```

The format of the w2r.rmt value is as follows,

```
[[slave address,function code,register address,data], [slave address,function code,register
address,data], [slave address,function code,register address,data], ..., [slave address,function
code,register address,data]]
```

Parameter description, See [W2R Parameters](#).

## 3.2 Reserved Group Settings

### 3.2.1 General Settings

| Parameter Name | Description                                                                                                                                                                                                                                                                                                                                                                                                                                   | Type   | Range    | Units | Optional  | Note                                                                                                                                                                                                                                                                                              |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|-------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| client_token   | A unique string for users to match responses with the corresponding requests.                                                                                                                                                                                                                                                                                                                                                                 | string |          |       | mandatory |                                                                                                                                                                                                                                                                                                   |
| interval       | uploading interval                                                                                                                                                                                                                                                                                                                                                                                                                            | int    | [0,3600] | s     | optional  | 0: disable timer upload                                                                                                                                                                                                                                                                           |
| interest       | <p>interest parameter<br/>List of interested item, each item is represented as key: alias.<br/>alias is used in reported messages to rewrite key, a value of "" means no alias.<br/>For example, set interest with alias: {"obd.mil": "MIL", "obd.dtcs": "dtcNum"}<br/>reported data: {"MIL": "1", "dtcNum": "3"}</p> <p>set interest without alias: {"obd.mil": "", "obd.dtcs": ""}<br/>reported data: {"obd.mil": "1", "obd.dtcs": "3"}</p> | object |          |       | optional  | <p>'key':<br/>FlexAPI<br/>Supported parameters<br/>'alias':<br/>parameter alias<br/>OBD group, see <a href="#">OBD Parameters</a><br/>GNSS group, see <a href="#">GNSS Parameters</a><br/>Motion group, see <a href="#">Motion Parameters</a><br/>IO group, see <a href="#">IO Parameters</a></p> |

For `interval` and `interest` parameters, there are four use cases which apply to both reserved and custom groups.

### Case 1. Disable Group Data Uploading

Specify only `interval` field and set its value to 0 in message body.

**Request Topic:** `v1/{client_id}/{group_name}/set`

**Note:** `group_name` is obd, gnss, motion, io, summary, or custom group name.

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 0
}
```

**Response Topic:** `v1/{client_id}/{group_name}/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "interval": 0
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### Case 2. Change Only Group Data Uploading Interval

Specify only `interval` field in message body.

**Request Topic:** `v1/{client_id}/{group_name}/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 60
}
```

**Response Topic:** `v1/{client_id}/{group_name}/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "result": {
    "interval": 60
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### Case 3. Change only group data interest

Specify only `interest` field in message body.

**Request Topic:** `v1/{client_id}/{group_name}/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
}
```

**Response Topic:** `v1/{client_id}/{group_name}/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "result": {
    "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

#### Case 4. Change Both Interest and Uploading Interval

Specify both `interest` and `interval` fields in message body.

**Request Topic:** `v1/{client_id}/{group_name}/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "interval": 60,
  "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
}
```

**Response Topic:** `v1/{client_id}/{group_name}/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "result": {
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### 3.2.3 OBD Settings

Publish a message to this topic to set your interested data and uploading interval.

Default interval is 10s. Default interest is available parameters from the [OBD Parameters](#).

**Request Topic:** `v1/{client_id}/obd/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 60,
  "interest": {"obd.mil": "MIL", "obd.dtcs": "dtcNum", "obd.rpm":
"engineSpeed"}
}
```

**Response Topic:** `v1/{client_id}/obd/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "interval": 60,
    "interest": {"obd.mil": "MIL", "obd.dtcs": "dtcNum", "obd.rpm":
"engineSpeed"}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### 3.2.4 GNSS Settings

Publish a message to this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the [GNSS Parameters](#).

**Request Topic:** `v1/{client_id}/gnss/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 60,
  "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"gnss.altitude": "alt"}
}
```

**Response Topic:** `v1/{client_id}/gnss/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"gnss.altitude": "alt"}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### 3.2.5 Motion Settings

Publish a message to this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the [Motion Parameters](#).

**Request Topic:** `v1/{client_id}/motion/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 60,
  "interest": {"motion.ax": "acceleration_x", "motion.ay": "acceleration_y",
"motion.az": "acceleration_z"}
}
```

**Response Topic:** `v1/{client_id}/motion/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "interval": 60,
    "interest": {"motion.ax": "acceleration_x", "motion.ay":
"acceleration_y", "motion.az": "acceleration_z"}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### 3.2.6 IO Settings

Publish a message to this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the [IO Parameters](#).

**Request Topic:** `v1/{client_id}/io/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 60,
  "interest": {"io.AI1": "ai1", "io.AI2": "ai2", "io.AI3": "ai3"}
}
```

**Response Topic:** `v1/{client_id}/io/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "interval": 60,
    "interest": {"io.AI1": "ai1", "io.AI2": "ai2", "io.AI3": "ai3"}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

### 3.2.7 Cellular1 Settings

Publish a message to this topic to set your interested data and uploading interval.

default interval is 30s. default interest is available parameters from the [Cellular Parameters](#).

**Request Topic:** `v1/{client_id}/cellular1/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "interval": 60,
  "interest": {"modem1.active_sim": "active_sim", "modem1.signal_lvl":
    "signal_lvl", "cellular1.status": "status"}
}
```

**Response Topic:** `v1/{client_id}/cellular1/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "interval": 60,
    "interest": {"modem1.active_sim": "active_sim", "modem1.signal_lvl":
      "signal_lvl", "cellular1.status": "status"}
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#).

## 3.3 On Demand Reserved Group Information Get

### 3.3.1 OBD Data

Publish a message to get OBD data on demand.

**Request Topic:** `v1/{client_id}/obd/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/obd/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "obd.rpm": 34245,
    "obd.speed": 53255
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, reference [General Information](#) & [OBD Parameters](#).

### 3.3.3 GNSS Data

Publish a message to get GNSS data on demand.

**Request Topic:** `v1/{client_id}/gnss/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/gnss/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "gnss.latitude": 40.232213,
    "gnss.longitude": 116.34366,
    "gnss.altitude": 346.0,
    "gnss.speed": 87.6,
    "gnss.heading": 234.0,
    "gnss.hdop": 1.2,
    "gnss.pdop": 2.1,
    "gnss.hacc": 1.0,
    "gnss.fix": 3,
    "gnss.num_sv": 7,
    "gnss.date": "2020-4-17",
    "gnss.time": "10:16:21"
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, reference [General Information](#) & [GNSS Parameters](#).

### 3.3.4 Motion Data

Publish a message to get motion data on demand.

**Request Topic:** `v1/{client_id}/motion/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/motion/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "motion.ax": 0.08,
    "motion.ay": 0.0,
    "motion.az": 0.0,
    "motion.gx": 0.15,
    "motion.gy": 0.03,
    "motion.gz": -0.47,
    "motion.roll": -0.65,
    "motion.pitch": 1.03,
    "motion.yaw": 302.49
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, reference [General Information](#) & [Motion Parameters](#).

### 3.3.5 IO Data

Publish a message to get IO data on demand.

**Request Topic:** `v1/{client_id}/io/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/io/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "io.AI1": 0.0,
    "io.DI1": 0,
    "io.DI1_pullup": 0,
    "io.DI2": 0,
    "io.DI2_pullup": 0,
    "io.DI3": 0,
    "io.DI3_pullup": 0,
    "io.DI4": 0,
    "io.DI4_pullup": 0,
    "io.DO1": 0,
    "io.DO2": 0,
    "io.DO3": 0
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, reference [General Information](#) & [IO Parameters](#).

### 3.3.6 Cellular1 Data

Publish a message to get cellular data on demand.

**Request Topic:** `v1/{client_id}/cellular1/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/cellular1/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "result": {
    "modem1.ts": 1598425245,
    "modem1.imei": "862104021247207",
    "modem1.imsi": "460013231603009",
    "modem1.iccid": "89860118802836799717",
    "modem1.signal_lvl": 29,
    "modem1.reg_status": 1,
    "modem1.operator": "46001",
    "modem1.network": 3,
    "modem1.lac": "EA00",
    "modem1.cell_id": "71CF520",
    "cellular1.ts": 1598425316,
    "cellular1.status": 3,
    "cellular1.ip": "10.210.255.168",
    "cellular1.netmask": "255.255.255.255",
    "cellular1.gateway": "1.1.1.3",
    "cellular1.dns1": "119.7.7.7",
    "cellular1.up_at": 1598424985
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS606lMhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, reference [General Information](#) & [Cellular Parameters](#).

### 3.3.7 System Info

Publish a message to get system info on demand.

**Request Topic:** `v1/{client_id}/sysinfo/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/sysinfo/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "sysinfo.ts": 1598424935,
    "sysinfo.model_name": "VT310",
    "sysinfo.oem_name": "inhand",
    "sysinfo.serial_number": "vF3102020122201",
    "sysinfo.firmware_version": "VT3_v1.0.22",
    "sysinfo.product_number": "FQ58",
    "sysinfo.description": "www.inhand.com.cn"
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, reference [General Information](#) & [System Parameters](#).

## 3.4 Control Service

### 3.4.1 IO Control

Publish a message to this topic to turn on/off the digital output.

**Request Topic:** `v1/{client_id}/io/control`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "io.DO1": 0,
  "io.DO2": 0,
  "io.DO3": 0
}
```

**Response Topic:** `v1/{client_id}/io/control/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "io.DO1": 0,
    "io.DO2": 0,
    "io.DO3": 0
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#) & [IO Parameters](#) digital output part.

## 4. Advanced Usage

### 4.1 Custom Group Settings

#### 4.1.1 Create/Update Custom Group

Use the following topics to define your interested groups and set their uploading intervals.

For `interval` and `interest` parameters, there are four use cases. See [General settings](#).

**Request Topic:** `v1/{client_id}/group/set`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "settings": [{
    "group_name": "group1",
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude":
"lon", "gnss.altitude": "alt", "obd.speed": "speed", "obd.odo": "odo"}
  }, {
    "group_name": "group2",
    "interval": 30,
    "interest": {"io.DI1": "DI1", "io.DI2": "DI2", "io.DI3":
"DI3", "io.DI4": "DI4", "io.DO1": "DO1", "io.DO2": "DO2", "io.DO3": "DO3"}
  }
  ]
}
```

**Response Topic:** `v1/{client_id}/group/set/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": [{
    "group_name": "group1",
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude":
"lon", "gnss.altitude": "alt", "obd.speed": "speed", "obd.odo": "odo"}
  }, {
    "group_name": "group2",
    "interval": 30,
    "interest": {"io.DI1": "DI1", "io.DI2": "DI2", "io.DI3":
"DI3", "io.DI4": "DI4", "io.DO1": "DO1", "io.DO2": "DO2", "io.DO3": "DO3"}
  }
  ]
}
```

Failure:

```
{  
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",  
  "error": "invalid_parameter",  
  "error_desc": "Invalid request parameter"  
}
```

Parameter description, see [General Information](#) & [General settings](#).

## 4.1.2 Get Custom Group Settings

Use the following topics to get custom group settings.

**Request Topic:** `v1/{client_id}/group/get`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/group/get/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": [{
    "group_name": "group1",
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude":
"lon", "gnss.altitude": "alt", "obd.speed": "speed", "obd.odo": "odo"}
  }, {
    "group_name": "group2",
    "interval": 30,
    "interest": {"io.DI1": "DI1", "io.DI2": "DI2", "io.DI3": "DI3", "io.DI4":
"DI4", "io.DO1": "DO1", "io.DO2": "DO2", "io.DO3": "DO3"}
  }]
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#) & [General settings](#).

## 4.2 Timer Triggered Custom Group Data Get

Once you have subscribed to this topic, you will periodically receive the related data.

**Topic:** `v1/{client_id}/{group_name}/info`

**Payload:**

```
{
  "lat": 40.232213,
  "ai1": 1.0,
  "obd.speed": 50
}
```

Parameter description, see [General Information](#) & [FlexAPI supported Parameters](#).

## 4.3 On Demand Custom Group Data Get

Publish a message to get `group_name` data on demand.

**Request Topic:** `v1/{client_id}/{group_name}/refresh`

**Request Payload:**

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J"
}
```

**Response Topic:** `v1/{client_id}/{group_name}/refresh/resp`

**Response Payload:**

Success:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "result": {
    "lat": 40.232213,
    "ai1": 1.0,
    "obd.speed": 50
  }
}
```

Failure:

```
{
  "client_token": "3bzJQ200UkLS6061Mhw3muUv73ycUT7J",
  "error": "invalid_parameter",
  "error_desc": "Invalid request parameter"
}
```

Parameter description, see [General Information](#) & [FlexAPI supported Parameters](#).

## 5. Event Service

---

## 5.1 Event Level

| Level Name | Value | Description                       |
|------------|-------|-----------------------------------|
| Emergency  | 5     | System is unusable.               |
| Alert      | 4     | Action must be taken immediately. |
| Error      | 3     | Error conditions.                 |
| Warning    | 2     | Warning conditions.               |
| Notice     | 1     | Normal but significant condition. |

## 5.2 Event Types

### 5.2.1 General event Types

| Event Name       | Event Type | Description                                           | Level | Note |
|------------------|------------|-------------------------------------------------------|-------|------|
| Ignition On      | IGON       | The ignition input has transitioned from low to high. | 1     |      |
| Ignition Off     | IGOFF      | The ignition input has transitioned from high to low. | 1     |      |
| system go sleep  | SYS_SLEEP  | The device entered deep sleep mode.                   | 1     |      |
| system wakeup    | SYS_WKUP   | The device recovered from deep sleep mode.            | 1     |      |
| DI value changed | DI_CHG     | The value of Digital Input pin is changed.            | 1     |      |

### 5.2.2 DTC event Types

| Event Name | Event Type      | Description                          | Level | Note                                                                |
|------------|-----------------|--------------------------------------|-------|---------------------------------------------------------------------|
| OBDII DTC  | OBDII_DTC_{dte} | OBDII diagnostic trouble code event. | 2     | dte: diagnostic trouble code string. see <a href="#">OBD-II DTC</a> |
| J1939 DTC  | J1939_DTC_{spn} | J1939 diagnostic trouble code event. | 2     | spn: see <a href="#">J1939 DTC</a>                                  |

## 5.3 Event parameters

| Parameter Name | Description                             | Type   | Range       | Units | Optional | Note                                                                                                         |
|----------------|-----------------------------------------|--------|-------------|-------|----------|--------------------------------------------------------------------------------------------------------------|
| starts_at      | Event start time                        | number |             | s     |          | UNIX timestamp, in seconds since the epoch                                                                   |
| ends_at        | Event end time                          | number |             | s     | Optional | UNIX timestamp, in seconds since the epoch. When the event is cleared, it is added to the event message body |
| status         | Event status                            | string | raise clear |       |          | raise: event occur<br>clear: event recovery                                                                  |
| type           | Event type                              | string |             |       |          | see <a href="#">Event Types</a>                                                                              |
| level          | Event level                             | number |             |       |          | see <a href="#">Event Level</a>                                                                              |
| gnss.xxx       | Additional location information(if any) |        |             |       | Optional | Location information associated with the event. see <a href="#">GNSS Parameters</a>                          |
| motion.xxx     | Additional motion information(if any)   |        |             |       | Optional | Motion information associated with the event. see <a href="#">Motion Parameters</a>                          |
| obd.xxx        | Additional obd information(if any)      |        |             |       | Optional | OBD information associated with the event. see <a href="#">OBD Parameters</a>                                |

| Parameter Name | Description                       | Type | Range | Units | Optional | Note                                                                        |
|----------------|-----------------------------------|------|-------|-------|----------|-----------------------------------------------------------------------------|
| io.xxx         | Additional io information(if any) |      |       |       | Optional | IO information associated with the event. see <a href="#">IO Parameters</a> |

## 5.4 Event examples

### 5.4.1 General event

Once you have subscribed to this topic, you will receive the related event information.

**Topic:** `v1/{client_id}/event/notice`

**Payload:**

```
{
  "starts_at" : 1642666533,
  "status" : "raise",
  "type" : "IGON",
  "level" : 1,
  "gnss.latitude" : 30.587996,
  "gnss.longitude" : 104.053223,
  "gnss.altitude" : 460.100006,
  "gnss.speed" : 0,
  "gnss.heading" : 0,
  "gnss.hdop" : 1.6,
  "io.ts" : 1642666533,
  "io.AI1" : 0,
  "io.DI1" : 0,
  "io.DI2" : 1,
  "io.DI3" : 0,
  "io.DI4" : 0,
  "io.DI1_pullup" : 0,
  "io.DI2_pullup" : 1,
  "io.DI3_pullup" : 0,
  "io.DI4_pullup" : 0,
  "io.DO1" : 0,
  "io.DO2" : 0,
  "io.DO3" : 0,
  "io.IGT" : 1,
  "motion.ax" : 0.171776,
  "motion.ay" : 0.127612,
  "motion.az" : -0.959652,
  "motion.gx" : 0.35,
  "motion.gy" : 0.56,
  "motion.gz" : -0.49
}
```

Parameter description, See [Event parameters](#) & [FlexAPI supported Parameters](#).

### 5.4.3 DTC event

Once you have subscribed to this topic, you will receive the related event information.

#### 5.4.3.1 OBD-II DTC

**Topic:** `v1/{client_id}/event/notice`

**Event occur:**

**Payload:**

```
{
  "starts_at": 1609901565,
  "status": "raise",
  "type": "OBDII_DTC_P070F",
  "level": 2,
  "dtc": "P070F",
  "desc": "Transmission Fluid Level Too Low",
  "gnss.longitude": -111.33,
  "gnss.latitude": 38.2222,
  "gnss.altitude": 230,
  "gnss.heading": 42.5,
  "gnss.speed": 55,
  "gnss.hdop": 2.1,
  "obd.speed": 55,
  "obd.f_lvl": 21,
  "obd.odo": 2025,
  "motion.ax": 0.0,
  "motion.ay": 0.0,
  "motion.az": 0.0,
  "motion.gx": 0.0,
  "motion.gy": 0.0,
  "motion.gz": 0.0
}
```

**Event recovery:**

**Payload:**

```
{
  "starts_at": 1609901565,
  "ends_at": 1609901820,
  "status": "clear",
  "type": "OBDII_DTC_P070F",
  "level": 2,
  "dtc": "P070F",
  "desc": "Transmission Fluid Level Too Low",
  "gnss.longitude": -111.33,
  "gnss.latitude": 38.2222,
  "gnss.altitude": 230,
  "gnss.heading": 42.5,
  "gnss.speed": 0,
  "gnss.hdop": 2.1,
  "obd.speed": 0,
  "obd.f_lvl": 21,
  "obd.odo": 2025,
  "motion.ax": 0.0,
```

```

    "motion.ay": 0.0,
    "motion.az": 0.0,
    "motion.gx": 0.0,
    "motion.gy": 0.0,
    "motion.gz": 0.0
  }

```

#### Parameter description:

| Parameter Name | Description                         | Type   | Range | Units | Optional | Note |
|----------------|-------------------------------------|--------|-------|-------|----------|------|
| dtc            | Diagnostic trouble code             | string |       |       |          |      |
| desc           | Diagnostic trouble code description | string |       |       | optional |      |

More parameter description, See [Event parameters](#) & [FlexAPI supported Parameters](#).

#### 5.4.3.2 J1939 DTC

**Topic:** `v1/{client_id}/event/notice`

**Event occur:**

**Payload:**

```

{
  "starts_at": 1609901565,
  "status": "raise",
  "type": "J1939_DTC_173",
  "level": 2,
  "src_addr": 0,
  "fmi": 3,
  "oc": 1,
  "spn": 173,
  "gnss.longitude": -111.33,
  "gnss.latitude": 38.2222,
  "gnss.altitude": 230,
  "gnss.heading": 42.5,
  "gnss.speed": 0,
  "gnss.hdop": 2.1,
  "obd.speed": 0,
  "obd.f_lvl": 21,
  "obd.odo": 2000,
  "motion.ax": 0.0,
  "motion.ay": 0.0,
  "motion.az": 0.0,
  "motion.gx": 0.0,
  "motion.gy": 0.0,
  "motion.gz": 0.0
}

```

**Event recovery:**

**Payload:**

```

{
  "starts_at": 1609901565,
  "ends_at": 1609901820,
  "status": "clear",
  "type": "J1939_DTC_173",
  "level": 2,
  "src_addr": 0,
  "fmi": 3,
  "oc": 1,
  "spn": 173,
  "gnss.longitude": -111.33,
  "gnss.latitude": 38.2222,
  "gnss.altitude": 230,
  "gnss.heading": 42.5,
  "gnss.speed": 0,
  "gnss.hdop": 2.1,
  "obd.speed": 0,
  "obd.f_lvl": 21,
  "obd.odo": 2000,
  "motion.ax": 0.0,
  "motion.ay": 0.0,
  "motion.az": 0.0,
  "motion.gx": 0.0,
  "motion.gy": 0.0,
  "motion.gz": 0.0
}

```

#### Parameter description:

| Parameter Name | Description              | Type | Range | Units | Optional | Note |
|----------------|--------------------------|------|-------|-------|----------|------|
| src_addr       | Source Address           | int  |       |       |          |      |
| fmi            | Failure Mode Indicator   | int  |       |       |          |      |
| oc             | Occurrence Count         | int  |       |       |          |      |
| spn            | Suspect Parameter Number | int  |       |       |          |      |

More parameter description, See [Event parameters](#) & [FlexAPI supported Parameters](#).

# Appendix A. FlexAPI Supported Parameters

## A.1 GNSS Parameters

| Parameter Name | Description                             | Type  | Range                                                               | Units | Optional  | Note                                       |
|----------------|-----------------------------------------|-------|---------------------------------------------------------------------|-------|-----------|--------------------------------------------|
| gnss.ts        | The last time the GNSS info was updated | int   |                                                                     | s     |           | UNIX timestamp, in seconds since the epoch |
| gnss.latitude  | latitude                                | float |                                                                     | deg   | mandatory |                                            |
| gnss.longitude | longitude                               | float |                                                                     | deg   | mandatory |                                            |
| gnss.altitude  | altitude                                | float |                                                                     | deg   | mandatory |                                            |
| gnss.speed     | speed                                   | float |                                                                     | km/h  | mandatory |                                            |
| gnss.heading   | heading                                 | float | [0.0,360.0]                                                         | °     |           |                                            |
| gnss.hdop      | Horizontal DOP                          | float |                                                                     |       |           |                                            |
| gnss.fix       | GNSS fix status                         | int   | 0: NoFix; 1: DR Only<br>2: 2D; 3: 3D<br>4: GNSS+DR;<br>5: Time Only |       |           |                                            |
| gnss.num_sv    | number of satellites used               | int   | [0,12]                                                              |       |           |                                            |

## A.2 Motion Parameters

| Parameter Name | Description                               | Type  | Range | Units | Optional  | Note                                       |
|----------------|-------------------------------------------|-------|-------|-------|-----------|--------------------------------------------|
| motion.ts      | The last time the Motion info was updated | int   |       | s     |           | UNIX timestamp, in seconds since the epoch |
| motion.ax      | x-axis accelerometer                      | float |       | g     | mandatory | accelerometer                              |
| motion.ay      | y-axis accelerometer                      | float |       | g     | mandatory | accelerometer                              |
| motion.az      | z-axis accelerometer                      | float |       | g     | mandatory | accelerometer                              |
| motion.gx      | x-axis gyroscope                          | float |       | deg/s | mandatory | gyroscope                                  |
| motion.gy      | y-axis gyroscope                          | float |       | deg/s | mandatory | gyroscope                                  |
| motion.gz      | z-axis gyroscope                          | float |       | deg/s | mandatory | gyroscope                                  |

## A.3 IO Parameters

| Parameter Name  | Description                           | Type  | Range                                   | Units | Optional  | Note                                       |
|-----------------|---------------------------------------|-------|-----------------------------------------|-------|-----------|--------------------------------------------|
| io.ts           | The last time the IO info was updated | int   |                                         | s     |           | UNIX timestamp, in seconds since the epoch |
| io.AI{n}        | Analog Input n                        | float | [0,36.0]<br>null:<br>invalid            | V     | mandatory | n: [1,1]                                   |
| io.DI{n}        | Digital Input n                       | int   | 0: low<br>1: high<br>null:<br>invalid   |       | mandatory | n: [1,4]                                   |
| io.DI{n}_pullup | Digital Input pullup n                | int   | 0:<br>down<br>1: up<br>null:<br>invalid |       | mandatory | n: [1,4]                                   |
| io.DO{n}        | Digital Output n                      | int   | 0: low<br>1: high<br>null:<br>invalid   |       | mandatory | n: [1,3]                                   |
| io.IGT          | Digital Input for ignition signal     | int   | 0: low<br>1: high<br>null:<br>invalid   |       |           |                                            |

## A.4 OBD Parameters

| Parameter Name     | Description                              | Type    | J1939<br>PGN:SPN | J1979<br>SID: PID | J1708<br>MID:PID | Range                                          | Units | Note                                       |
|--------------------|------------------------------------------|---------|------------------|-------------------|------------------|------------------------------------------------|-------|--------------------------------------------|
| obd.ts             | The last time the OBD info was updated   | int     | N/A              | N/A               | N/A              | N/A                                            | s     | UNIX timestamp, in seconds since the epoch |
| obd.vin            | Vehicle Identification Number            | string  | 65260:237        | 09h:02h           | 128:237          | Not Supported                                  |       |                                            |
| obd.e_load         | Engine Load                              | double  | 61443:92         | 01h:04h           | 128:92           | [0,250.00] 0: stopped >0: started              | %     |                                            |
| obd.c_temp         | Engine Coolant Temp                      | int     | 65262:110        | 01h:05h           | 128:110          | [-40,215]                                      | °C    |                                            |
| obd.rpm            | Engine Speed                             | double  | 61444:190        | 01h:0Ch           | 128:190          | [0,16383.75]                                   | RPM   |                                            |
| obd.speed          | Vehicle Speed                            | int     | 65265:84         | 01h:0Dh           | 128:84           | [0,255]                                        | km/h  |                                            |
| obd.f_lvl          | Fuel Level                               | double  | 65276:96         | 01h:2Fh           | 140:96           | [0,100.00]                                     | %     |                                            |
| obd.f_rate         | Fuel Rate                                | double  | 65266:183        | 01h:5Eh           | 128:183          | [0,3276.75]                                    | l/h   |                                            |
| obd.dtcs           | DTC Count                                | int     | 65230:1218       | 01h:01h           | Not Supported    | [0,250]                                        |       |                                            |
| obd.mil            | MIL Status                               | boolean | 65226:1213       | 01h:01h           | Not Supported    | 0:off 1:on                                     |       |                                            |
| obd.b_volt         | Battery Voltage                          | double  | 65271:168        | 0x01:0x42         | 128:168          | [0,3212.75]                                    | V     |                                            |
| obd.a_temp         | Ambient Air Temp                         | int     | 65269:171        | 01h:46h           | 140:171          | [-273,1734]                                    | °C    |                                            |
| obd.o_temp         | Engine Oil Temp                          | int     | 65262:175        | 01h:5Ch           | 128:175          | [-273,1734]                                    | °C    |                                            |
| obd.up_time        | Engine Start Time                        | int     | 64952:3301       | 01h:1Fh           | Not Supported    | [0,65535]                                      | sec   |                                            |
| obd.m_dist         | Distance traveled while MIL is Activated | int     | 49408:3069       | 01h:21h           | Not Supported    | [0,65535]                                      | km    |                                            |
| obd.d_dist         | Distance traveled since DTCs cleared     | int     | 49408:3294       | 01h:31h           | Not Supported    | [0,65535]                                      | km    |                                            |
| obd.m_time         | Engine run time while MIL activated      | int     | 49408:3295       | Not Supported     | Not Supported    | [0,65535]                                      | min   |                                            |
| obd.d_time         | Engine run time since DTCs cleared       | int     | 49408:3296       | Not Supported     | Not Supported    | [0,65535]                                      | min   |                                            |
| obd.f_press        | Fuel Pressure                            | int     | 64929:3480       | 01h:0Ah           | 128:94           | [0,6425]                                       | kPa   |                                            |
| obd.t_pos          | Throttle Position                        | double  | 65266:51         | 01h:11h           | 128:51           | [0,100.00]                                     | %     |                                            |
| obd.brake          | Brake Switch Status                      | boolean | 65265:597        | Not Supported     | 128:65           | 0:brake pedal released 1:brake pedal depressed |       |                                            |
| obd.parking        | Parking Brake Switch Status              | boolean | 65265:70         | Not Supported     | 128:70           | 0:parking brake not set 1:parking brake set    |       |                                            |
| obd.s_w_angle      | Steering Wheel Angle                     | double  | 61449:1807       | Not Supported     | Not Supported    | [-31.374,31.374]                               | rad   |                                            |
| obd.f_econ         | Fuel Economy                             | double  | 65266:185        | Not Supported     | 128:185          | [0,125.50]                                     | km/L  |                                            |
| obd.odo            | Odometer                                 | double  | 65248:245        | 01h:a6h           | 128:245          | [0,526385151.875]                              | km    |                                            |
| obd.a_pos          | Accelerator Pedal Position               | double  | 61443:91         | Not Supported     | 128:91           | [0,100.00]                                     | %     |                                            |
| obd.t_dist         | trip distance                            | double  | 65248:244        | 01h: 21h          | 128:244          | [0,526385151.875]                              | km    |                                            |
| obd.i_temp         | Intake Manifold Temp                     | int     | 65270:105        | 01h:0Fh           | 128:105          | [-40,215]                                      | °C    |                                            |
| obd.i_press        | Intake Manifold Pressure                 | int     | 65270:102        | 01h:0Bh           | Not Supported    | [0,255]                                        | kPa   |                                            |
| obd.b_press        | Barometirc Pressure                      | int     | 65269:108        | 01h:33h           | 128:108          | [0,255]                                        | kPa   |                                            |
| obd.f_r_press      | Fuel Rail Pressure                       | int     | 64765:5313       | 01h:23h           | Not Supported    | [0,65530]                                      | kPa   |                                            |
| obd.r_torque       | Engine reference Torque                  | int     | 65251:544        | 01h:63h           | Not Supported    | [0,64255]                                      | Nm    |                                            |
| obd.f_torque       | Engine friction Torque                   | float   | 65247:514        | 01h:8Eh           | Not Supported    | [-125.00,125.00]                               | %     |                                            |
| obd.max_avl_torque | Engine Maximum Available Torque          | float   | 61443:3357       | Not Supported     | Not Supported    | [0,100.00]                                     | %     |                                            |
| obd.a_torque       | Engine actual Torque                     | float   | 61444:513        | 01h:62h           | 128:93           | [-125.00,125.00]                               | %     |                                            |
| obd.d_e_f_vol      | Diesel Exhaust Fluid Volume              | float   | 65110:1761       | Not Supported     | Not Supported    | [0,100.00]                                     | %     |                                            |

| Parameter Name       | Description                                             | Type  | J1939<br>PGN:SPN | J1979<br>SID: PID | J1708<br>MID:PID | Range                          | Units | Note        |
|----------------------|---------------------------------------------------------|-------|------------------|-------------------|------------------|--------------------------------|-------|-------------|
| obd.mf_mon           | Misfire Monitor Status                                  | int   | 65230:1221       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.f_s_mon          | Fuel System Monitor<br>Status                           | int   | 65230:1221       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.c_c_mon          | Comprehensive<br>Component Monitor<br>Status            | int   | 65230:1221       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.c_mon            | Catalyst Monitor Status                                 | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.h_c_mon          | Heated Catalyst Monitor<br>Status                       | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.e_s_mon          | Evaporative System<br>Monitor Status                    | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.s_a_s_mon        | Secondary Air System<br>Monitor Status                  | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.a_s_r_mon        | A/C System Refrigerant<br>Monitor Status                | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.e_g_s_mon        | Exhaust Gas Sensor<br>Monitor Status                    | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.e_g_s_h_mon      | Exhaust Gas Sensor<br>heater Monitor Status             | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.e_v_s_mon        | EGR/VVT System Monitor<br>Status                        | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.c_s_a_s_mon      | Cold Start Aid System<br>Monitor Status                 | int   | 65230:1222       | Not<br>Supported  | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.b_p_c_s_mon      | Boost Pressure Control<br>System Monitor Status         | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.dpf_mon          | DPF Monitor Status                                      | int   | 65230:1222       | Not<br>Supported  | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.n_c_mon          | NOx Catalyst Monitor<br>Status                          | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.nmhc_mon         | NMHC Catalyst Monitor<br>Status                         | int   | 65230:1222       | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.o_s_mon          | Oxygen Sensor Monitor<br>Status                         | int   | Not<br>Supported | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.o_s_h_mon        | Oxygen Sensor heater<br>Monitor Status                  | int   | Not<br>Supported | 01h:01h           | Not<br>Supported | 0:not completed<br>1:completed |       |             |
| obd.brake_prim_press | Brake Primary Pressure                                  | float | Not<br>Supported | Not<br>Supported  | 140:117          |                                | kPa   | unavailable |
| obd.brake_sec_press  | Brake Secondary<br>Pressure                             | float | Not<br>Supported | Not<br>Supported  | 140:118          |                                | kPa   | unavailable |
| obd.e_hours          | "Engine Total Hours of<br>Operation                     | int   | 65253:247        | Not<br>Supported  | Not<br>Supported |                                | h     |             |
| obd.ab_level         | Aftertreatment 1 Diesel<br>Exhaust Fluid Tank<br>Volume | float | 65110:1761       | Not<br>Supported  | Not<br>Supported |                                | %     |             |

## A.5 Cellular Parameters

| Parameter Name    | Description                                   | Type   | Range | Units | Optional | Note                                                                                                                                                                                                                                                                                                      |
|-------------------|-----------------------------------------------|--------|-------|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| modem1.ts         | The last time the modem1 info was updated     | int    |       | s     |          | UNIX timestamp, in seconds since the epoch                                                                                                                                                                                                                                                                |
| modem1.imei       | IMEI code                                     | string |       |       |          |                                                                                                                                                                                                                                                                                                           |
| modem1.imsi       | IMSI code                                     | string |       |       |          |                                                                                                                                                                                                                                                                                                           |
| modem1.iccid      | ICCID code                                    | string |       |       |          |                                                                                                                                                                                                                                                                                                           |
| modem1.phone_num  | phone number                                  | string |       |       |          |                                                                                                                                                                                                                                                                                                           |
| modem1.signal_lvl | signal level                                  | number |       | asu   |          |                                                                                                                                                                                                                                                                                                           |
| modem1.reg_status | register status                               | number | [0,6] |       |          | 0: Not registered, ME is not currently searching an operator to register to<br>1: Registered, home network<br>2: Not registered, but ME is currently trying to attach or searching an operator to register to<br>3: Registration denied<br>4: Unknown, e.g. out of LTE coverage<br>5: Registered, roaming |
| modem1.operator   | operator                                      | string |       |       |          |                                                                                                                                                                                                                                                                                                           |
| modem1.network    | network type                                  | number | [0,3] |       |          | 0: NA, 1: 2G, 2: 3G, 3: 4G                                                                                                                                                                                                                                                                                |
| modem1.lac        | LAC                                           | string |       |       |          | hexadecimal                                                                                                                                                                                                                                                                                               |
| modem1.cell_id    | Cell ID                                       | string |       |       |          | hexadecimal                                                                                                                                                                                                                                                                                               |
| modem1.rssi       | RSSI(Received Signal Strength Indication)     | number |       | dBm   |          |                                                                                                                                                                                                                                                                                                           |
| modem1.rsrp       | RSRP(Reference Signal Receiving Power)        | number |       | dBm   |          |                                                                                                                                                                                                                                                                                                           |
| modem1.rsrq       | RSRQ(Reference Signal Receiving Quality)      | number |       | dB    |          |                                                                                                                                                                                                                                                                                                           |
| modem1.sinr       | SINR(Signal to Interference plus Noise Ratio) | number |       | dB    |          |                                                                                                                                                                                                                                                                                                           |
| cellular1.status  | cellular1 network status                      | number | [0,3] |       |          | 0: destroy<br>1: create<br>2: down<br>3: up                                                                                                                                                                                                                                                               |

| Parameter Name    | Description              | Type   | Range | Units | Optional | Note |
|-------------------|--------------------------|--------|-------|-------|----------|------|
| cellular1.ip      | cellular1 ip address     | string |       |       |          |      |
| cellular1.netmask | cellular1 netmask        | string |       |       |          |      |
| cellular1.gateway | cellular1 gateway        | string |       |       |          |      |
| cellular1.dns1    | cellular1 dns1           | string |       |       |          |      |
| cellular1.up_at   | cellular1 connected time | number |       | s     |          |      |

## A.6 System Parameters

| Parameter Name           | Description                                | Type   | Range | Units | Optional | Note                                       |
|--------------------------|--------------------------------------------|--------|-------|-------|----------|--------------------------------------------|
| sysinfo.ts               | The last time the sysinfo info was updated | int    |       | s     |          | UNIX timestamp, in seconds since the epoch |
| sysinfo.model_name       | model name                                 | string |       |       |          |                                            |
| sysinfo.oem_name         | OEM name                                   | string |       |       |          |                                            |
| sysinfo.serial_number    | serial number                              | string |       |       |          |                                            |
| sysinfo.firmware_version | firmware version                           | string |       |       |          |                                            |
| sysinfo.product_number   | product number                             | string |       |       |          |                                            |
| sysinfo.description      | description                                | string |       |       |          |                                            |

## A.7 Sensor Parameters

| Parameter Name | Description                               | Type   | Range | Units | Optional | Note                                                                   |
|----------------|-------------------------------------------|--------|-------|-------|----------|------------------------------------------------------------------------|
| sensor.ts      | The last time the sensor info was updated | int    |       | s     |          | UNIX timestamp, in seconds since the epoch                             |
| sensor.data    | sensor data                               | string |       |       |          |                                                                        |
| type           | sensor type                               | string |       |       |          | 1W_TP: temperature sensor                                              |
| id             | sensor id                                 | string |       |       |          |                                                                        |
| value          | sensor value                              | string |       | °C    |          | This parameter is sent only when the sensor type is temperature sensor |

## A.8 W2R Parameters

| Parameter Name | Description                            | Type   | Range | Units | Optional | Note                                       |
|----------------|----------------------------------------|--------|-------|-------|----------|--------------------------------------------|
| w2r.ts         | The last time the w2r info was updated | int    |       | s     |          | UNIX timestamp, in seconds since the epoch |
| w2r.if         | interface name                         | string |       |       |          |                                            |
| w2r.proto      | protocol type                          | string |       |       |          | Only modbus(RS485) is supported.           |
| w2r.rmt        | data from interface.                   |        |       |       |          | Only modbus(RS485) is supported.           |