FlexAPI Reference

For 3rd Party Platform (TCP Version)

Revision History

Revision	Date	Author	Item(s) changed	Note
1.0.0	14/12/2020	wangzy	Create document.	
1.0.1	01/04/2021	wangzy	Add CRC16 checksum.	
1.0.2	27/1/2021	wangzy	Added 1-wire group	
1.0.3	2/12/2022	dengzt, yangming	Added forward group. Add modem1.submode key Add gnss.type gnss.acc_heading key Add sysinfo.power_management_version key Add VG814 support Update General Error Codes Introduce event service, add DI_CHG event Add io.power_input, io.igt_status and io.DOX_pullup key Add PGN:SPN & SID:PID for OBD parameters	

1. Introduction

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 TCP connection for 3rd party platforms. Our device acts as a TCP client to access the third-party platform server.

For data service, each topic corresponds to a group of data, and we have ready to use reserved groups such as: GNSS, OBD, Motion, IO and Summary.

Note that the Summary group is the all in one data group which includes all the data from our reserved OBD, GNSS, Motion and IO groups.

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

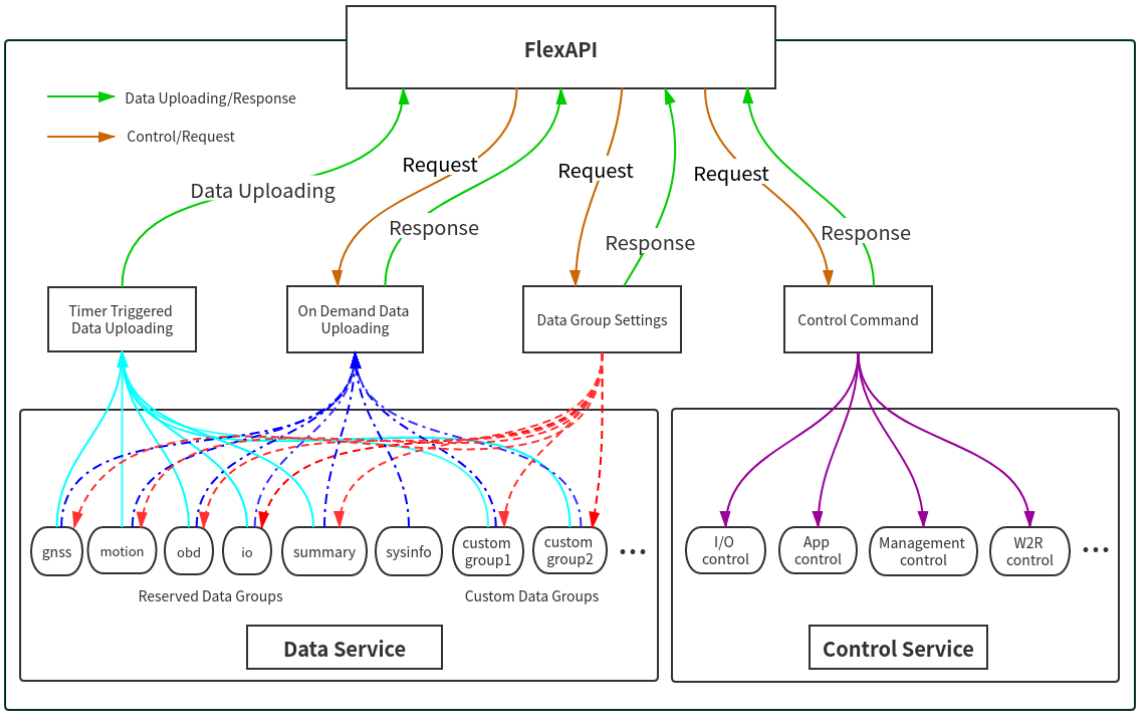
Users can send different request to get data for the topic, and they can also set the data uploading intervals.

FlexAPI also provides topics for users to apply control, such as turn on/off the digital output.

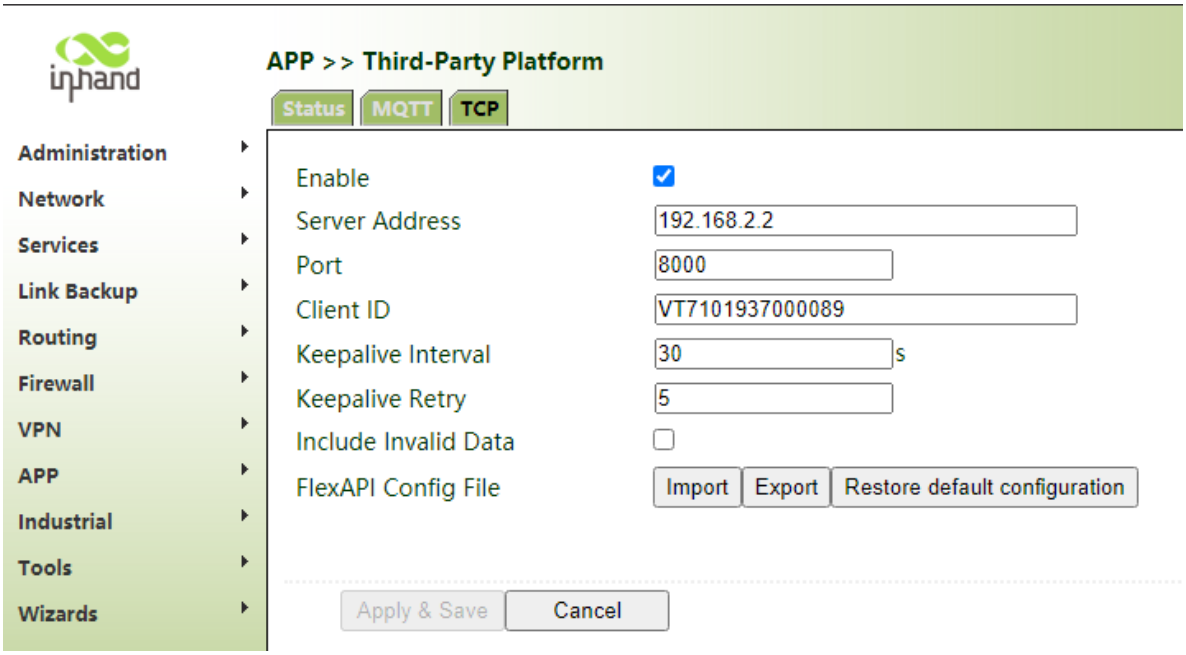
FlexAPI specially provides topics for users to actively get data on demand.

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

1.1 Architecture



1.2 TCP Settings



- **Enable**: Turn on or off the TCP connection for third-party platform.
- **Server Address**: IP addresses of TCP server for third-party platform.
- **Port**：Port of TCP server for third-party platform.
- **Client ID**: The ID of the TCP client that connects to a third-party platform, the default Client ID is the device serial number.

  Note: The Client ID is the unique ID used to identify the device. The server can use this ID to determine which device to send the request to.
- **Keepalive Interval**: The keepalive interval of TCP connection.
- **Keepalive Retry**: The number of TCP connection keepalive retries.

- **Include Invalid Data**: if enabled, FlexAPI will also return invalid data items with `null` value besides valid data items.
- **FlexAPI Config File**: Mange FlexAPI configuration file of FlexAPI-TCP.

1.3 TCP Packet Structure

Data	$ (0x24)	{··· ···"key": "value" ··· ···}		<CR> <LF> (0x0D 0x0A)
Section	Head	JSON Data	CRC16	End
Size(Bytes)	1		2	2

- **Head:** The start character of packet.
- **JSON Data:** The message in JSON format in packet.
- **CRC16:** Checksum, Only the JSON data part is calculated. CRC parameter: POLY: 0x8005 (x^16 + x^15 + x^2 + 1), INIT: 0x0000, XOROUT: 0x0000.
- **End:** The end sequence of packet.

1.4 TCP Packet Examples

The original packet:

```
24 7B 22 74 6F 70 69 63 22 3A 20 22 76 31 2F 56 54 37 31 30 31 39 33 37 30 30
30 30 38 39 2F 75 73 65 72 64 61 74 61 2F 69 6E 66 6F 22 2C 20 22 70 61 79 6C
6F 61 64 22 3A 20 7B 22 75 73 65 72 64 61 74 61 2E 73 65 72 69 61 6C 5F 6E 75
6D 62 65 72 22 3A 20 22 56 47 37 31 30 22 2C 20 22 75 73 65 72 64 61 74 61 2E
63 75 73 74 6F 6D 5F 6B 65 79 22 3A 20 22 63 75 73 74 6F 6D 5F 76 61 6C 75 65
22 7D 7D 71 E4 0D 0A
```

- **24** : The head of the packet.
- **7B 22 ... ... 7D 7D**: The JSON message is :

```
{"topic": "v1/VT7101937000089/userdata/info", "payload":
{"userdata.serial_number": "VG710", "userdata.custom_key":
"custom_value"}}
```

- **71 E4** : The CRC of the JSON messgae.
- **0D 0A** : The end sequence of packet.

2 FlexAPI Overview

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. 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 include topics in the requests they send, and get the data through different 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
Request	Server-->Client	Operations	A request sent by third-party platform server to client device.
Response	Client-->Server	Operations	A response sent by client device to third-party platform server.
topic	topic	string	Each TCP message contains a topic, and the device returns different payload based on that topic.
payload	payload	object	message content.
result	result	object	When the request succeeds, there will be result field in response message body. 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. For more information, see General Error Codes
error_desc	error description	string	When the request fails, it is added to the response message body. For more information, see General Error Codes
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
invalid_token	token non-existent or expired	retry request
data_invalid	resource invalid	retry request
data_empty	request resource is empty	retry request
over_group_num	group number exceeds limit	check request parameter
over_data_num	keys of interest number exceeds limit	check request parameter
find_same_key	can not insert same key	check request parameter
interval_invalid	interval range is invalid	check request parameter
not_support	operation is not support	check request parameter

2.2 FlexAPI supported Topics

2.2.1 Data service

2.2.1.1 Timer triggered reserved group data get

The server can receive messages with the following topics to get the latest data.

Topic	Allowed Operations	Description
v1/{client_id}/summary/info	Receive	Timer triggered Summary data uploading. see Summary Data.
v1/{client_id}/obd/info	Receive	Timer triggered OBD data uploading. See OBD data.
v1/{client_id}/gnss/info	Receive	Timer triggered GNSS data uploading. see GNSS Data.
v1/{client_id}/motion/info	Receive	Timer triggered Motion data uploading. see Motion Data.
v1/{client_id}/io/info	Receive	Timer triggered IO data uploading. see IO Data.
v1/{client_id}/cellular1/info	Receive	Timer triggered Cellular1 data uploading. see Cellular1 Data.
v1/{client_id}/userdata/info	Receive	Timer triggered User data uploading. see User Data.
v1/{client_id}/1-wire/info	Receive	Timer triggered 1-wire data uploading. see 1-wire Data.
v1/{client_id}/forward/info	Receive	Timer triggered Forward data uploading. see Forward Data.

2.2.1.2 Reserved group settings

The server can send a messages with the following topics to set the data uploading intervals and define their interested data.

Topic	Allowed Operations	Description
v1/{client_id}/summary/set	Request	Set Summary group request. see Summary settings.
v1/{client_id}/summary/set/resp	Response	Set Summary group response.
v1/{client_id}/obd/set	Request	Set OBD group request. see OBD settings.
v1/{client_id}/obd/set/resp	Response	Set OBD group response.
v1/{client_id}/gnss/set	Request	Set GNSS group request. see GNSS settings.
v1/{client_id}/gnss/set/resp	Response	Set GNSS group response.
v1/{client_id}/motion/set	Request	Set Motion group request. see Motion settings.
v1/{client_id}/motion/set/resp	Response	Set Motion group response.
v1/{client_id}/io/set	Request	Set IO group request. see IO settings.
v1/{client_id}/io/set/resp	Response	Set IO group response.
v1/{client_id}/cellular1/set	Request	Set Celluar1 group request. see Cellular1 settings.
v1/{client_id}/cellular1/set/resp	Response	Set Celluar1 group response.
v1/{client_id}/userdata/set	Request	Set User data group request. see User data settings.
v1/{client_id}/userdata/set/resp	Response	Set User data group response.
v1/{client_id}/1-wire/set	Request	Set 1-wire group request. see 1-wire settings.
v1/{client_id}/1-wire/set/resp	Response	Set 1-wire group response.

2.2.1.3 On demand reserved group data get

The server can send a messages with the following topics to actively get data on demand.

Topic	Allowed Operations	Description

Topic	Allowed Operations	Description
v1/{client_id}/summary/refresh	Request	Refresh Summary data request. see Summary Data.
v1/{client_id}/summary/refresh/resp	Response	Refresh Summary data response.
v1/{client_id}/obd/refresh	Request	Refresh OBD data request. see OBD data.
v1/{client_id}/obd/refresh/resp	Response	Refresh OBD data response.
v1/{client_id}/gnss/refresh	Request	Refresh GNSS data request. see GNSS Data.
v1/{client_id}/gnss/refresh/resp	Response	Refresh GNSS data response.
v1/{client_id}/motion/refresh	Request	Refresh Motion data request. see Motion Data.
v1/{client_id}/motion/refresh/resp	Response	Refresh Motion data response.
v1/{client_id}/io/refresh	Request	Refresh IO data request. see IO Data.
v1/{client_id}/io/refresh/resp	Response	Refresh IO data response.
v1/{client_id}/cellular1/refresh	Request	Refresh Cellular1 data request. see Cellular1 Data.
v1/{client_id}/cellular1/refresh/resp	Response	Refresh Cellular1 data response.
v1/{client_id}/sysinfo/refresh	Request	Refresh system info request. see System Info.
v1/{client_id}/sysinfo/refresh/resp	Response	Refresh system info response.
v1/{client_id}/userdata/refresh	Request	Refresh User data request. see User data.
v1/{client_id}/userdata/refresh/resp	Response	Refresh user data info response.
v1/{client_id}/1-wire/refresh	Request	Refresh 1-wire data request. see 1-wire data.
v1/{client_id}/1-wire/refresh/resp	Response	Refresh 1-wire data info response.

2.2.2 Control Service

2.2.2.1 IO control

The server can send a messages with the following topics to turn on/off the digital output.

Topic	Allowed Operations	Description
v1/{client_id}/io/control	Request	IO control request. see IO Control.
v1/{client_id}/io/control/resp	Response	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.

2.2.3.1 Custom group settings

2.2.3.1.1 Create/Update custom group

Topic	Allowed Operations	Description
v1/{client_id}/group/set	Request	Create/Update group request. see Create/Update custom group.
v1/{client_id}/group/set/resp	Response	Create/Update group response.

2.2.3.1.2 Get custom group settings

Topic	Allowed Operations	Description
v1/{client_id}/group/get	Request	Get group settings request. see Get custom group settings.
v1/{client_id}/group/get/resp	Response	Get group settings response.

2.2.3.1.3 Remove custom group

Topic	Allowed Operations	Description
v1/{client_id}/group/set	Request	Remove group request. see Remove custom group.
v1/{client_id}/group/set/resp	Response	Remove group response.

2.2.3.2 Timer triggered custom group data get

Topic	Allowed Operations	Description
v1/{client_id}/{group_name}/info	Response	Timer triggered custom group data uploading. see Timer triggered custom group data get.

2.2.3.3 On demand custom group data get

Topic	Allowed Operations	Description
v1/{client_id}/{group_name}/refresh	Request	Refresh group data request. see On demand custom group data get.
v1/{client_id}/{group_name}/refresh/resp	Response	Refresh group data response.

2.3 FlexAPI Limits

Resource	Limit
Minimum retry interval of `settings`, `refresh`, `get` requests	1 s
Minimum retry interval of `io control` request	5 s
`client_id` size	up to 128 bytes of `UTF-8` encoded characters
`client_token` size	up to 256 bytes of arbitrary string
Available custom groups	up to 16
Maximum data items per group	256

3. Basic usage

3.1 Timer triggered reserved group data get

3.1.1 Summary data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：


```
{
    "topic":"v1/{client_id}/summary/info",
    "payload":{
        "summary.ul_ts" : 1592820540,
        "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.pdop": 2.1,
        "gnss.hacc": 1.0,
        "gnss.fix": 3,
        "gnss.num_sv": 7,
        "gnss.date": "2020-4-17",
        "gnss.time": "10:16:21",
        "obd.ts" : 1592820539,
        "obd.rpm" : 1234,
        "obd.speed" : 20,
        "obd.odo": 1400,
        "obd.up_time": 3600,
        "io.ts" : 1592820539,
        "io.AI1": 0.0,
        "io.AI2": 0.0,
        "io.AI3": 0.0,
        "io.AI4": 0.0,
        "io.AI5": 0.0,
        "io.AI6": 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.DI5": 0,
        "io.DI5_pullup": 0,
        "io.DI6": 0,
        "io.DI6_pullup": 0,
        "io.DO1": 0,
        "io.DO1_pullup": 0,
        "io.DO2": 0,
        "io.DO2_pullup": 0,
        "io.DO3": 0,
```

```
        "io.DO3_pullup": 0,
        "io.DO4": 0,
        "io.DO4_pullup": 0
    }
}
```

Parameter description, See General Information & FlexAPI supported Parameters.

Use Summary settings to modify group setting(`interval` & `interest`).

3.1.2 OBD data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/obd/info",
    "payload":{
        "obd.ul_ts" : 1592820540,
        "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`).

3.1.3 GNSS data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/gnss/info",
    "payload":{
        "gnss.ul_ts" : 1592820540,
        "gnss.ts" : 1592820539,
        "gnss.type" : "GPS+Glonass",
        "gnss.latitude": 40.232213,
        "gnss.longitude": 116.34366,
        "gnss.altitude": 346.0,
        "gnss.speed": 87.6,
        "gnss.heading": 234.0,
        "gnss.acc_heading": 3.0,
        "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"
    }
}
```

Parameter description, See General Information & GNSS Parameters.

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

3.1.4 Motion data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/motion/info",
    "payload":{
        "motion.ul_ts" : 1592820540,
        "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,
        "motion.roll": -0.65,
        "motion.pitch": 1.03,
        "motion.yaw": 302.49
    }
}
```

Parameter description, See General Information & Motion Parameters.

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

3.1.5 IO data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/io/info",
    "payload":{
        "io.ul_ts": 1592820540,
        "io.ts": 1592820539,
        "io.AI1": 0.0,
        "io.AI2": 0.0,
        "io.AI3": 0.0,
        "io.AI4": 0.0,
        "io.AI5": 0.0,
        "io.AI6": 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.DI5": 0,
        "io.DI5_pullup": 0,
        "io.DI6": 0,
        "io.DI6_pullup": 0,
        "io.DO1": 0,
        "io.DO1_pullup": 0,
        "io.DO2": 0,
        "io.DO2_pullup": 0,
        "io.DO3": 0,
        "io.DO3_pullup": 0,
        "io.DO4": 0,
        "io.DO4_pullup": 0,
        "io.power_input": 11.22,
        "io.igt_status": 1
    }
}
```

Parameter description, See General Information & IO Parameters.

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

3.1.6 Cellular1 data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/modem1/info",
    "payload":{
       "cellular1.ts": 1598425380,
        "modem1.ts": 1598425365,
        "modem1.active_sim": 1,
        "modem1.imei": "862104021247207",
        "modem1.imsi": "460013231603009",
        "modem1.iccid": "89860118802836799717",
        "modem1.signal_lvl": 28,
        "modem1.reg_status": 1,
        "modem1.operator": "46001",
        "modem1.network": 3,
        "modem1.submode": "SA",
        "modem1.lac": "EA00",
        "modem1.cell_id": "71CF520",
        "cellular1.ts": 1598425501,
        "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.dns2": "119.6.6.6",
        "cellular1.up_at": 1598424985,
        "cellular1.down_at": 0,
        "cellular1.traffic_ts": 1598425501,
        "cellular1.tx_bytes": 120488,
        "cellular1.rx_bytes": 34098
    }
}
```

Parameter description, See General Information & Cellular Parameters.

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

3.1.7 User data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/userdata/info",
    "payload":{
        "userdata.custom_key": "custom_value",
        "userdata.serial_number":"SN0125"
    }
}
```

Parameter description, See General Information.

Use User data settings to modify group setting(`interval` & `interest`).

3.1.8 1-Wire data

Once you have sent the settings message to client, you will periodically receive the related data.

Received Message：

```
{
    "topic":"v1/{client_id}/1-wire/info",
    "payload":{
        "1-wire.ul_ts" : 1592820540,
        "1-wire.ts": 1644560984,
        "1-wire.status" : "Connected",
        "1-wire.type" : "Temperature & ROM Code",
        "1-wire.temp_num" : 2,
        "1-wire.rom_num" : 1,
        "1-wire.temp1_data" : 24.56,
        "1-wire.temp1_id" : "aa012029901e7928",
        "1-wire.temp1_name" : "Inside",
        "1-wire.temp2_data" : 24.75,
        "1-wire.temp2_id" : "27012029cf6a8328",
        "1-wire.temp2_name" : "Outside",
        "1-wire.rom_code1" : "cc00001b559ae001"
    }
}
```

Parameter description, See General Information.

Use 1-Wire data settings to modify group setting(`interval` & `interest`).

3.1.9 Forward Data

Once you have sent the settings message to client, you will periodically receive the related data.

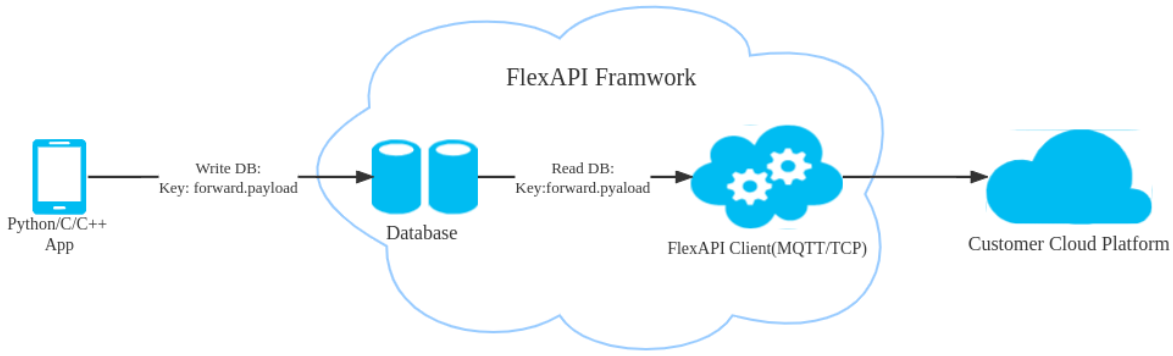
Topic：`v1/{client_id}/forward/info`

Payload：

```
# Payload is customized by the customer, usually written by the APP
```

Note:

APP can set any collected data to berkeley db with predefined key (database home: `/tmp/dbhome/daq.env`, database file: Forward Parameters) , then use the FlexAPI client(MQTT/TCP) to send the data out. APP does not need to implement an independent client, so that it can focus on the specific business.



Parameter description, See Forward Parameters.

3.2 Reserved group settings

3.2.1 General settings

Parameter Name	Description	Type	Range	Units	Optional	Note

Parameter Name	Description	Type	Range	Units	Optional	Note
interval	uploading interval	int	[0,3600]	s	optional	0: disable timer upload
interest	interest parameter List of interested item, each item is represented as key: alias. alias is used in reported messages to rewrite key, a value of "" means no alias. For example, set interest with alias: {"obd.mil": "MIL", "obd.dtcs": "dtcNum"} reported data: {"MIL": "1", "dtcNum": "3"} set interest without alias: {"obd.mil": "", "obd.dtcs": ""} reported data: {"obd.mil": "1", "obd.dtcs": "3"}	object			optional	'key': FlexAPI Supported parameters 'alias': parameter alias OBD group, see OBD Parameters GNSS group, see GNSS Parameters Motion group, see Motion Parameters IO group, see IO Parameters

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.

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

Request Message：

```
{
   "topic":"v1/{client_id}/{group_name}/set",
   "payload":{
         "interval": 0
   }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "interval":0
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

Case 2. Change only group data uploading interval

Specify only `interval` field in message body.

Request Message：

```
{
   "topic":"v1/{client_id}/{group_name}/set",
   "payload":{
         "interval": 60
   }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "interval": 60
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

Case 3. Change only group data interest

Specify only `interest` field in message body.

Request Message：

```
{
   "topic":"v1/{client_id}/{group_name}/set",
   "payload":{
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
   }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "interest":{"obd.speed":"speed", "obd.odo":"", "gnss.latitude":"lat",
"gnss.longitude":"lon"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

Case 4. Change both interest and uploading interval

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

Request Message：

```
{
   "topic":"v1/{client_id}/{group_name}/set",
   "payload":{
       "interval": 60,
       "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
   }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "interval": 60,
        "interest":{"obd.speed":"speed", "obd.odo":"", "gnss.latitude":"lat",
"gnss.longitude":"lon"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.2 Summary settings

Send a message to client with this topic to set your interested data and uploading interval.

Default interval is 10s. Default interest is available parameters from the FlexAPI supported Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/summary/set",
    "payload":{
        "interval": 60,
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/summary/set/resp",
    "result":{
        "interval": 60,
        "interest":{"obd.speed":"speed", "obd.odo":"", "gnss.latitude":"lat",
"gnss.longitude":"lon"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/summary/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.3 OBD settings

Send a message to client with this topic to set your interested data and uploading interval.

Default interval is 10s. Default interest is available parameters from the OBD Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/obd/set",
    "payload":{
        "interval": 60,
        "interest": {"obd.mil": "MIL", "obd.dtcs": "dtcNum", "obd.rpm": "engineSpeed"}
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/obd/set/resp",
    "result":{
        "interval": 60,
        "interest": {"obd.mil": "MIL", "obd.dtcs": "dtcNum", "obd.rpm": "engineSpeed"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/obd/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.4 GNSS settings

Send a message to client with this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the GNSS Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/gnss/set",
    "payload":{
        "interval": 60,
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"gnss.altitude": "alt"}
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/gnss/set/resp",
    "result":{
        "interval": 60,
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"gnss.altitude": "alt"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/gnss/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.5 Motion settings

Send a message to client with this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the Motion Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/motion/set",
    "payload":{
        "interval": 60,
        "interest": {"motion.ax": "acceleration_x", "motion.ay": "acceleration_y", "motion.az": "acceleration_z"}
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/motion/set/resp",
    "result":{
        "interval": 60,
        "interest": {"motion.ax": "acceleration_x", "motion.ay": "acceleration_y", "motion.az": "acceleration_z"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/motion/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.6 IO settings

Send a message to client with this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the IO Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/io/set",
    "payload":{
        "interval": 60,
        "interest": {"io.AI1": "ai1", "io.AI2": "ai2", "io.AI3": "ai3"}
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/io/set/resp",
    "result":{
        "interval": 60,
        "interest": {"io.AI1": "ai1", "io.AI2": "ai2", "io.AI3": "ai3"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/io/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.7 Cellular1 settings

Send a message to client with this topic to set your interested data and uploading interval.

default interval is 30s. default interest is available parameters from the Cellular Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/cellular1/set",
    "payload":{
        "interval": 60,
        "interest": {"modem1.active_sim": "active_sim", "modem1.signal_lvl": "signal_lvl", "cellular1.status": "status"}
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/cellular1/set/resp",
    "result":{
        "interval": 60,
        "interest": {"modem1.active_sim": "active_sim", "modem1.signal_lvl": "signal_lvl", "cellular1.status": "status"}
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/cellular1/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.8 User Data settings

3.2.8.1 Insert user data

Send a message to client with this topic to insert new user data.

Request Message：

```
{
    "topic": "v1/{client_id}/userdata/set",
    "payload":{
        "insert": {
            "userdata.custom_key": "custom_value",
            "userdata.serial_number": "SN0125"
        }
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "inserted": {
            "userdata.custom_key": "custom_value",
            "userdata.serial_number": "SN0125"
        }
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

3.2.8.2 Update user data

Send a message to client with this topic to update your user data.

Note: The data to be updated must be data that has already been created.

Request Message：

```
{
    "topic": "v1/{client_id}/userdata/set",
    "payload":{
        "update": {
            "userdata.serial_number": "SN0232"
        }
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "updated": {
            "userdata.serial_number": "SN0232"
        }
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

3.2.8.3 Set User Data report interval

Send a message to client with this topic to set your uploading interval.

default interval is 10s.

Request Message：

```
{
    "topic": "v1/{client_id}/userdata/set",
    "payload":{
        "interval": 60
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
         "interval": 60
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

3.2.8.4 Delete user data

Send a message to client with this topic to delete your user data.

Note: The data to be deleted must be data that has already been created.

Request Message：

```
{
    "topic": "v1/{client_id}/userdata/set",
    "payload":{
        "delete": {
            "userdata.serial_number":"serial_number"
        }
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "deleted": {
            "userdata.serial_number":"serial_number"
        }
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/userdata/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.2.9 1-Wire Data Settings

Send a message to client with this topic to set your interested data and uploading interval.

default interval is 10s. default interest is available parameters from the 1-Wire Parameters.

Request Message：

```
{
    "topic": "v1/{client_id}/1-wire/set",
    "payload":{
        "interval": 20,
        "interest": {
            "1-wire.temp1_data" : "data1",
            "1-wire.temp1_id" : "ID1",
            "1-wire.temp1_name" : "name1"
        }
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/1-wire/set/resp",
    "result":{
        "interval" : 20,
        "interest" : {
            "1-wire.temp1_data" : "data1",
            "1-wire.temp1_id" : "ID1",
            "1-wire.temp1_name" : "name1"
        }
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/1-wire/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information.

3.3 On demand reserved group data get

3.3.1 Summary data

Send a message to client with this topic to get summary data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/summary/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/summary/refresh/resp",
    "result": {
        "summary.ul_ts" : 1592820540,
        "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",
        "obd.rpm" : 1234,
        "obd.speed" : 20,
        "obd.odo": 1400,
        "obd.up_time": 3600,
        "io.AI1": 0.0,
        "io.AI2": 0.0,
        "io.AI3": 0.0,
        "io.AI4": 0.0,
        "io.AI5": 0.0,
        "io.AI6": 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.DI5": 0,
        "io.DI5_pullup": 0,
        "io.DI6": 0,
        "io.DI6_pullup": 0,
        "io.DO1": 0,
        "io.DO1_pullup": 0,
```

```
        "io.DO2": 0,
        "io.DO2_pullup": 0,
        "io.DO3": 0,
        "io.DO3_pullup": 0,
        "io.DO4": 0,
        "io.DO4_pullup": 0
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/summary/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information & FlexAPI supported Parameters.

3.3.2 OBD data

Send a message to client with this topic to get OBD data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/obd/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/obd/refresh/resp",
    "result": {
        "obd.rpm": 34245,
        "obd.speed": 53255
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/obd/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & OBD Parameters.

3.3.3 GNSS data

Send a message to client with this topic to get GNSS data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/gnss/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/gnss/refresh/resp",
    "result": {
        "gnss.ul_ts" : 1592820540,
        "gnss.type" : "GPS+Glonass",
        "gnss.latitude": 40.232213,
        "gnss.longitude": 116.34366,
        "gnss.altitude": 346.0,
        "gnss.speed": 87.6,
        "gnss.heading": 234.0,
        "gnss.acc_heading": 3.0,
        "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：

```
{
    "topic":"v1/{client_id}/gnss/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & GNSS Parameters.

3.3.4 Motion data

Send a message to client with this topic to get motion data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/motion/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/motion/refresh/resp",
    "result": {
        "motion.ul_ts" : 1592820540,
        "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：

```
{
    "topic":"v1/{client_id}/motion/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & Motion Parameters.

3.3.5 IO data

Send a message to client with this topic to get IO data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/io/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/io/refresh/resp",
    "result": {
        "io.ul_ts" : 1592820540,
        "io.AI1": 0.0,
        "io.AI2": 0.0,
        "io.AI3": 0.0,
        "io.AI4": 0.0,
        "io.AI5": 0.0,
        "io.AI6": 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.DI5": 0,
        "io.DI5_pullup": 0,
        "io.DI6": 0,
        "io.DI6_pullup": 0,
        "io.DO1": 0,
        "io.DO1_pullup": 0,
        "io.DO2": 0,
        "io.DO2_pullup": 0,
        "io.DO3": 0,
        "io.DO3_pullup": 0,
        "io.DO4": 0,
        "io.DO4_pullup": 0,
        "io.power_input": 11.22,
        "io.igt_status": 1
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/io/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & IO Parameters.

3.3.6 Cellular1 Data

Send a message to client with this topic to get cellular data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/cellular1/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/cellular1/refresh/resp",
    "result": {
        "cellular1.ul_ts" : 1592820540,
        "modem1.ts": 1598425245,
        "modem1.active_sim": 1,
        "modem1.imei": "862104021247207",
        "modem1.imsi": "460013231603009",
        "modem1.iccid": "89860118802836799717",
        "modem1.signal_lvl": 29,
        "modem1.reg_status": 1,
        "modem1.operator": "46001",
        "modem1.network": 3,
        "modem1.submode": "SA",
        "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.dns2": "119.6.6.6",
        "cellular1.up_at": 1598424985,
        "cellular1.down_at": 0,
        "cellular1.traffic_ts": 1598425316,
        "cellular1.tx_bytes": 83777,
        "cellular1.rx_bytes": 30258
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/cellular1/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & Cellular Parameters.

3.3.7 System Info

Send a message to client with this topic to get system info on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/sysinfo/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/sysinfo/refresh/resp",
    "result": {
        "sysinfo.ul_ts" : 1592820540,
        "sysinfo.ts": 1598424935,
        "sysinfo.language": "Chinese",
        "sysinfo.hostname": "VG710",
        "sysinfo.timezone": "UTC-8",
        "sysinfo.model_name": "VG710",
        "sysinfo.oem_name": "inhand",
        "sysinfo.serial_number": "VG7102019052101",
        "sysinfo.firmware_version": "1.0.0.r13083",
        "sysinfo.bootloader_version": "2012.07.r235",
        "sysinfo.product_number": "TL01",
        "sysinfo.description": "www.inhand.com.cn",
        "sysinfo.lan_mac": "00:18:05:10:99:66",
        "sysinfo.wlan_mac": "00:18:05:10:99:03",
        "sysinfo.wlan_5g_mac": "00:18:05:10:99:04",
        "sysinfo.power_management_version": "VG710-5G-Ga-GD.V2.2.0"
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/sysinfo/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & System Parameters.

3.3.8 User Data

Send a message to client with this topic to get user data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/userdata/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/userdata/refresh/resp",
    "result": {
        "userdata.custom_key":"custom_value",
        "userdata.serial_number":"SN0125"
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/userdata/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information.

3.3.9 APP data

Send a message to client with this topic to get APP data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/app/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/app/refresh/resp",
    "result": {
        "app.ul_ts" : 1592820540,
        "app.wifi_mode_2g": 0,
        "app.wifi_mode_5g": 0
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/app/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & APP Parameters.

Note:
We can use the specified key to control the behavior of APP.

3.3.10 1-Wire Data

Send a message to client with this topic to get 1-wire data on demand.

Request Message：

```
{
    "topic": "v1/{client_id}/1-wire/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/1-wire/refresh/resp",
    "result": {
        "1-wire.ul_ts" : 1592820540,
        "1-wire.ts": 1644560984",
        "1-wire.status" : "Connected",
        "1-wire.type" : "Temperature & ROM Code",
        "1-wire.temp_num" : 2,
        "1-wire.rom_num" : 1,
        "1-wire.temp1_data" : 24.06,
        "1-wire.temp1_id" : "aa012029901e7928",
        "1-wire.temp1_name" : "Inside",
        "1-wire.temp2_data" : 23.69,
        "1-wire.temp2_id" : "27012029cf6a8328",
        "1-wire.temp2_name" : "Outside",
        "1-wire.rom_code1" : "cc00001b559ae001"
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/1-wire/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, reference General Information & 1-wire Parameters.

3.4 Control Service

3.4.1 IO Control

Send a message to client with this topic to turn on/off digital output, and digital input pull-up.

Request Message：

```
{
    "topic": "v1/{client_id}/io/control",
    "payload":{
        "io.DO1": 0,
        "io.DO1_pullup": 0,
        "io.DO2": 0,
        "io.DO2_pullup": 0,
        "io.DO3": 0,
        "io.DO3_pullup": 0,
        "io.DO4": 0,
        "io.DO4_pullup": 0
        "io.DI1_pullup": 1,
        "io.DI2_pullup": 1,
        "io.DI3_pullup": 1,
        "io.DI4_pullup": 1,
        "io.DI5_pullup": 1,
        "io.DI6_pullup": 1
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/io/control/resp",
    "result": {
        "io.DO1": 0,
        "io.DO1_pullup": 0,
        "io.DO2": 0,
        "io.DO2_pullup": 0,
        "io.DO3": 0,
        "io.DO3_pullup": 0,
        "io.DO4": 0,
        "io.DO4_pullup": 0,
        "io.DI1_pullup": 1,
        "io.DI2_pullup": 1,
        "io.DI3_pullup": 1,
        "io.DI4_pullup": 1,
        "io.DI5_pullup": 1,
        "io.DI6_pullup": 1
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/io/control/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information & IO Parameters digital output part.

3.4.2 APP Control

Send a message to client with this topic to notify APP to do something.

Request Message：

```
{
    "topic": "v1/{client_id}/app/control",
    "payload":{
        "app.wifi_mode_2g": 0,
        "app.wifi_mode_5g": 0
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/app/control/resp",
    "result": {
        "app.wifi_mode_2g": 0,
        "app.wifi_mode_5g": 0
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/app/control/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information & APP 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 Message：

```
{
    "topic": "v1/{client_id}/group/set",
    "payload":{
        "settings": [{
            "group_name": "group1",
            "interval": 60,
            "interest": {"gnss.latitude": "lat","gnss.longitude":
"lon","gnss.altitude": "alt","obd.speed": "speed","obd.odo":
"odo","userdata.custom_key":"custom_key"}
            },{
            "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 Message：

Success：

```
{
    "topic":"v1/{client_id}/group/set/resp",
    "result": {
        "settings": [{
            "group_name": "group1",
            "interval": 60,
            "interest": {"gnss.latitude": "lat","gnss.longitude":
"lon","gnss.altitude": "alt","obd.speed": "speed","obd.odo":
"odo","userdata.custom_key":"custom_key"}
            },{
            "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：

```
{
    "topic":"v1/{client_id}/group/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid 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 Message：

```
{
    "topic": "v1/{client_id}/group/get"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/group/get/resp",
    "result": [{
        "group_name": "group1",
        "interval": 60,
        "interest": {"gnss.latitude": "lat","gnss.longitude":
"lon","gnss.altitude": "alt","obd.speed": "speed","obd.odo":
"odo","userdata.custom_key":"custom_key"}
    },{
        "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：

```
{
    "topic":"v1/{client_id}/group/get/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information & General settings.

4.1.3 Remove custom group

Use the following topics to remove group.

Request Message：

```
{
    "topic": "v1/{client_id}/group/set",
    "payload":{
        "settings": [{
            "group_name": "group1",
            "interest": null
        },{
            "group_name": "group2",
            "interest": null
            }
        ]
    }
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/group/set/resp",
    "result": [{
            "group_name": "group1",
            "interest": null
        },{
            "group_name": "group2",
            "interest": null
        }
    ]
}
```

Failure：

```
{
    "topic":"v1/{client_id}/group/set/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid parameter"
    }
}
```

Parameter description, see General Information & General settings.

4.2 Timer triggered custom group data get

Once you have sent a settings message, you will periodically receive the related data.

Response Message：

```
{
    "topic":"v1/{client_id}/{group_name}/info",
    "payload":{
        "lat": 40.232213,
        "ai1": 1.0,
        "obd.speed": 50,
        "userdata.custom_key":"custom_value"
    }
}
```

Parameter description, see General Information & FlexAPI supported Parameters.

4.3 On demand custom group data get

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

Request Message：

```
{
    "topic": "v1/{client_id}/{group_name}/refresh"
}
```

Response Message：

Success：

```
{
    "topic":"v1/{client_id}/{group_name}/refresh/resp",
    "result": {
        "lat": 40.232213,
        "ai1": 1.0,
        "obd.speed": 50,
        "userdata.custom_key":"custom_value"
    }
}
```

Failure：

```
{
    "topic":"v1/{client_id}/{group_name}/refresh/resp",
    "result":{
        "error":"invalid_parameter",
        "error_desc":"invalid 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
DI value changed	DI_CHG	The value of Digital Input pin is changed. On page **Services >> Power Management** , select option **Digital Input Report** to enable	1	

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 clear：event recovery
type	Event type	string				see Event Types
level	Event level	number				see Event Level
gnss.xxx	Additional location information(if any)				Optional	Location information associated with the event. see GNSS Parameters
motion.xxx	Additional motion information(if any)				Optional	Motion information associated with the event. see Motion Parameters

Parameter Name	Description	Type	Range	Units	Optional	Note
obd.xxx	Additional obd information(if any)				Optional	OBD information associated with the event. see OBD Parameters
io.xxx	Additional io information(if any)				Optional	IO information associated with the event. see IO Parameters

5.4 Event examples

5.4.1 General event

Once the event occurs, you will receive the related event information.

Topic：`v1/{client_id}/event/notice`

Payload：

```
{
    "topic": "v1/VG7102021120902/event/notice",
    "payload": {
        "starts_at": 1669774648,
        "status": "raise",
        "type": "DI_CHG",
        "level": 1,
        "gnss.latitude": 0.0,
        "gnss.longitude": 0.0,
        "gnss.altitude": 0.0,
        "gnss.speed": 0.0,
        "gnss.heading": 0.0,
        "gnss.hdop": 99.989999999999995,
        "gnss.pdop": 99.989999999999995,
        "gnss.fix": 0,
        "gnss.num_sv": 0,
        "io.ul_ts": 1669774648,
        "io.AI1": 9.1999999999999993,
        "io.AI2": 0.040000000000000001,
        "io.AI3": 0.029999999999999999,
        "io.AI4": 9.2100000000000009,
        "io.DI1": 1,
        "io.DI2": 1,
        "io.DI3": 0,
        "io.DI4": 1,
        "io.DI1_pullup": 1,
        "io.DI2_pullup": 1,
```

```
        "io.DI3_pullup": 0,
        "io.DI4_pullup": 1,
        "io.DO1": 0,
        "io.DO2": 0,
        "io.DO3": 1,
        "io.DO4": 0,
        "io.DO1_pullup": 0,
        "io.DO2_pullup": 0,
        "io.DO3_pullup": 0,
        "io.DO4_pullup": 0,
        "io.power_input": 11.15,
        "io.igt_status": 1
    }
}
```


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.type	Type of GNSS constellation used	string	Beidou GPS+Beidou GPS+Glonass GPS+Galileo			
gnss.latitude	latitude	float		deg	mandatory	
gnss.longitude	longitude	float		deg	mandatory	
gnss.altitude	altitude	float		deg	mandatory	
gnss.speed	speed	float		knots	mandatory	
gnss.heading	heading	float	[0.0,360.0]	°		
gnss.acc_heading	heading accuracy estimate	float	[0.0,360.0]	°		
gnss.hdop	Horizontal DOP	float				
gnss.pdop	Position DOP	float				
gnss.hacc	Horizontal accuracy estimate	float		m		
gnss.fix	GNSS fix status	int	0: NoFix; 1: DR Only 2: 2D; 3: 3D 4: GNSS+DR; 5: Time Only			
gnss.num_sv	number of satellites used	int	[0,12]			
gnss.date	date	string	format: yy-mm-dd			
gnss.time	time	string	format: hh:mm:ss			

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
motion.roll	roll angle	float		deg	mandatory	
motion.pitch	pitch angle	float		deg	mandatory	
motion.yaw	yaw angle	float		deg	mandatory	

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] null：invalid	V	mandatory	n: [1,6]
io.DI{n}	Digital Input n	int	0: low 1: high null：invalid		mandatory	n: [1,6]
io.DI{n}_pullup	Digital Input pullup n	int	0: down 1: up null：invalid		mandatory	n: [1,6]
io.DO{n}	Digital Output n	int	0: low 1: high null：invalid		mandatory	n: [1,4]
io.DO{n}_pullup	Digital Output pullup n	int	0: down 1: up null：invalid		mandatory	n:[1,4]
io.power_input	Supply voltage	float	[0,36.0]	V		
io.igt_status	Ignition signal	int	0:off 1:on			

A.4 OBD Parameters

Parameter Name	Description	Type	J1939 PGN:SPN	J1979 SID:PID	Range	Units	Optional
obd.ts	The last time the OBD info was updated	int	N/A	N/A		s	
obd.vin	Vehicle Identification Number	string	65260:237	09h:02h			
obd.e_load	Engine Load	double	61443:92	01h:04h	[0,250.00] 0: stopped >0: started	%	
obd.c_temp	Engine Coolant Temp	int	65262:110	01h:05h	[-40,215]	℃	
obd.rpm	Engine Speed	double	61444:190	01h:0Ch	[0,16383.75]	RPM	
obd.speed	Vehicle Speed	int	65265:84	01h:0Dh	[0,255]	km/h	
obd.f_lvl	Fuel Level	double	65276:96	01h:2Fh	[0,100.00]	%	
obd.f_rate	Fuel Rate	double	65266:183	01h:5Eh	[0,3276.75]	l/h	
obd.dtcs	DTC Count	int	65230:1218	01h:01h	[0,250]		
obd.mil	MIL Status	boolean	65226:1213	01h:01h	0:off 1:on		
obd.b_volt	Battery Voltage	double	65271:168	01h:42h	[0,3212.75]	V	
obd.a_temp	Ambient Air Temp	int	65269:171	01h:46h	[-273,1734]	℃	
obd.o_temp	Engine Oil Temp	int	65262:175	01h:5Ch	[-273,1734]	℃	
obd.up_time	Engine Start Time	int	64952:3301	01h:1Fh	[0,65535]	sec	
obd.m_dist	Distance traveled while MIL is Activated	int	49408:3069	01h:21h	[0,65535]	km	
obd.d_dist	Distance traveled since DTCs cleared	int	49408:3294	01h:31h	[0,65535]	km	
obd.m_time	Engine run time while MIL activated	int	49408:3295	Not Supported	[0,65535]	min	
obd.d_time	Engine run time since DTCs cleared	int	49408:3296	Not Supported	[0,65535]	min	
obd.f_press	Fuel Pressure	int	64929:3480	01h:0Ah	[0,6425]	kPa	
obd.t_pos	Throttle Position	double	65266:51	01h:11h	[0,100.00]	%	
obd.brake	Brake Switch Status	boolean	65265:597	Not Supported	0:brake pedal released 1:brake pedal depressed		
obd.parking	Parking Brake Switch Status	boolean	65265:70	Not Supported	0:parking brake not set 1:parking brake set		
obd.s_w_angle	Steering Wheel Angle	double	61449:1807	Not Supported	[-31.374,31.374]	rad	
obd.f_econ	Fuel Economy	double	65266:185	Not Supported	[0,125.50]	km/L	
obd.odo	Odometer	double	65248:245	01h:a6h	[0,526385151.875]	km	
obd.a_pos	Accelerator Pedal Position	double	61443:91	Not Supported	[0,100.00]	%	
obd.t_dist	trip distance	double	65248:244	01h:21h	[0,526385151.875]	km	

Parameter Name	Description	Type	J1939 PGN:SPN	J1979 SID:PID	Range	Units	Optional
obd.i_temp	Intake Manifold Temp	int	65270:105	01h:0Fh	[-40,215]	℃	
obd.i_press	Intake Manifold Pressure	int	65270:102	01h:0Bh	[0,255]	kPa	
obd.b_press	Barometirc Pressure	int	65269:108	01h:33h	[0,255]	kPa	
obd.f_r_press	Fuel Rail Pressure	int	64765:5313	01h:23h	[0,65530]	kPa	
obd.r_torque	Engine reference Torque	int	65251:544	01h:63h	[0,64255]	Nm	
obd.f_torque	Engine friction Torque	float	65247:514	01h:8Eh	[-125.00,125.00]	%	
obd.max_avl_torque	Engine Maximum Available Torque	float	61443:3357	Not Supported	[0,100.00]	%	
obd.a_torque	Engine actual Torque	float	61444:513	01h:62h	[-125.00,125.00]	%	
obd.d_e_f_vol	Diesel Exhaust Fluid Volume	float	65110:1761	Not Supported	[0,100.00]	%	
obd.mf_mon	Misfire Monitor Status	int	65230:1221	01h:01h	0:not completed 1:completed		
obd.f_s_mon	Fuel System Monitor Status	int	65230:1221	01h:01h	0:not completed 1:completed		
obd.c_c_mon	Comprehensive Component Monitor Status	int	65230:1221	01h:01h	0:not completed 1:completed		
obd.c_mon	Catalyst Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.h_c_mon	Heated Catalyst Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.e_s_mon	Evaporative System Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.s_a_s_mon	Secondary Air System Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.a_s_r_mon	A/C System Refrigerant Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.e_g_s_mon	Exhaust Gas Sensor Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.e_g_s_h_mon	Exhaust Gas Sensor heater Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.e_v_s_mon	EGR/VVT System Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.c_s_a_s_mon	Cold Start Aid System Monitor Status	int	65230:1222	Not Supported	0:not completed 1:completed		
obd.b_p_c_s_mon	Boost Pressure Control System Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		

Parameter Name	Description	Type	J1939 PGN:SPN	J1979 SID:PID	Range	Units	Optional
obd.dpf_mon	DPF Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.n_c_mon	NOx Catalyst Monitor Status	int	65230:1222	01h:01h	0:not completed 1:completed		
obd.nmhc_mon	NMHC Catalyst Monitor Status	int	Not Supported	01h:01h	0:not completed 1:completed		
obd.o_s_mon	Oxygen Sensor Monitor Status	int	Not Supported	01h:01h	0:not completed 1:completed		
obd.o_s_h_mon	Oxygen Sensor heater Monitor Status	int	Not Supported	01h:01h	0:not completed 1:completed		
obd.pf_mon	PF Monitor Status	int	65230:1222	Not Supported	0:not completed 1:completed		

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.active_sim	active SIM card	number	[1,2]			1: SIM1, 2: SIM2
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. 1: Registered, home network. 2: Not registered, but ME is currently trying to attach or searching an operator to register to. 3: Registration denied. 4: Unknown, e.g. out of LTE coverage. 5: Registered, roaming.
modem1.operator	operator	string				
modem1.network	network type	number	[0,4]			0: NA, 1: 2G, 2: 3G, 3: 4G, 4:5G

Parameter Name	Description	Type	Range	Units	Optional	Note
modem1.submode	network subtype	string				"SA"/"NSA"
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.ts	The last time the cellular1 network info was updated	int		s		UNIX timestamp, in seconds since the epoch
cellular1.status	cellular1 network status	number	[0,3]			0: destroy 1: create 2: down 3: up
cellular1.ip	cellular1 ip address	string				
cellular1.netmask	cellular1 netmask	string				
cellular1.gateway	cellular1 gateway	string				
cellular1.dns1	cellular1 dns1	string				
cellular1.dns2	cellular1 dns2	string				
cellular1.up_at	cellular1 connected timestamp	number		s		UNIX timestamp, in seconds since the epoch
cellular1.down_at	cellular1 disconnected timestamp	number		s		UNIX timestamp, in seconds since the epoch

Parameter Name	Description	Type	Range	Units	Optional	Note
cellular1.traffic_ts	The last time the cellular1 traffic info was updated	int		s		
cellular1.tx_bytes	TX bytes	int		byte		
cellular1.rx_bytes	RX bytes	int		byte		

A.6 System Parameters

Parameter Name	Description	Type	Range	Units	Optional	Note
sysinfo.ts	The last time the modem1 info was updated	int		s		UNIX timestamp, in seconds since the epoch
sysinfo.language	language	string				Chinese|English
sysinfo.hostname	hostname	string				
sysinfo.timezone	timezone	string				
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.bootloader_version	bootloader version	string				
sysinfo.product_number	product number	string				
sysinfo.description	description	string				
sysinfo.lan_mac	MAC address of bridge1, is the same with device label	string				
sysinfo.wlan_mac	MAC address of 2G WiFi	string				
sysinfo.wlan_5g_mac	MAC address of 5G WiFi	string				
sysinfo.power_management_version	Firmware version for power manage board	string				

A.7 APP Parameters

Parameter Name	Description	Type	Range	Units	Optional	Note
app.wifi_mode_2g	Notify `WIFIControl` APP to change 2.4G Wi-Fi mode	int	0:AP 1:STA -1:N/A(status only)			
app.wifi_mode_5g	Notify `WIFIControl` APP to change 5G Wi-Fi mode	int	0:AP 1:STA -1:N/A(status only)			

A.8 1-Wire Parameters

Parameter Name	Description	Type	Range	Units	Optional	Note
1-wire.status	The connection state of 1-wire bus	string	"Connected" "Disconnected"			
1-wire.type	The type of device on 1-wire bus	string	"Temperature" "ROM Code" "Temperature & ROM Code"			
1-wire.temp_num	The number of temperature sensor devices on 1-wire bus	int	[1, 4]			
1-wire.rom_num	The number of electronic registration code devices on 1-wire bus	int	[1, 4]			
1-wire.tempN_data	The temperature value of one of the temperature sensors on 1-wire bus	float		°C		
1-wire.tempN_id	The ID of one of the temperature sensors on 1-wire bus	string				
1-wire.tempN_name	The custom name of one of the temperature sensors on 1-wire bus	string			Optional	
1-wire.rom_codeN	The value of one of the electronic registration codes on 1-wire bus	string				

Note: The letter N in a parameter like "1-wire.tempN_data" and "1-wire.rom_codeN" represents the number of sensors on 1-wire, on a scale of 1 to 4.

A.9 Forward Parameters

Parameter Name	Description	Type	Range	Units	Note
forward.payload	Content is customized by the customer, usually written by the APP	string			DB file: forward.db
forward.payload_bt	Content is customized by the customer, usually written by the APP(BT information)	string			DB file: forward_bt.db
forward.payload_can	Content is customized by the customer, usually written by the APP(CAN information)	string			DB file: forward_can.db
forward.payload_obdcan	Content is customized by the customer, usually written by the APP(OBD information)	string			DB file: forward_obdcan.db