FlexAPI Over TCP Reference

For VT3 series

Revision History

Revision	Date	Author	Item(s) changed	Note
1.0.1	12/7/2021	liyb	Created this document based on <FlexAPI_Reference_for_3rd_party_platform>	

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 messages for 3rd party platforms.

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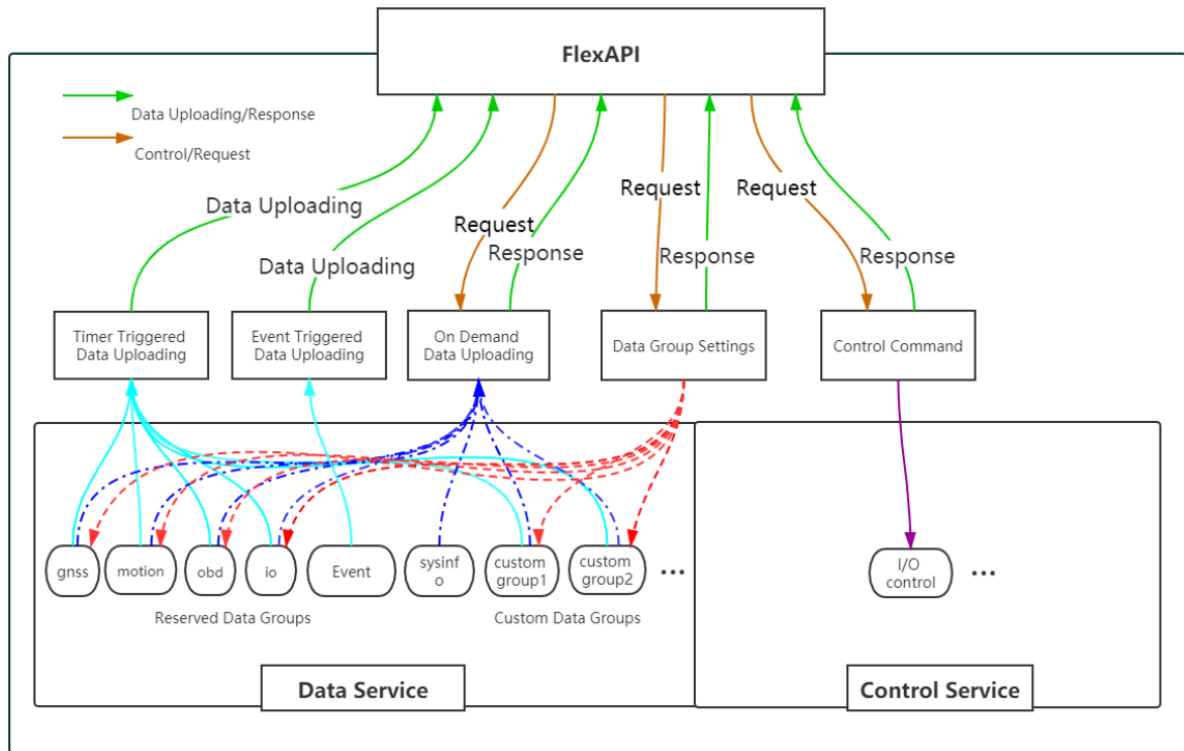
Besides, user can use sysinfo group to obtain device basic information.

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

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.

1.1 Architecture

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 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

2.1.0 FlexAPI Message Format.

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.

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. 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
data_invalid	resource invalid	retry request

2.3 FlexAPI Limits

Resource	Limit
Minimum retry interval of `settings`, `refresh`, `get` requests	3 s
Minimum retry interval of `io control` request	5 s
`client_id` size	SN of VT3 series
`client_token` size	up to 32 bytes of arbitrary string
Available custom groups	up to 8
Maximum data items per group	32

3. Basic Usage

3.1 Timer Triggered Reserved Group Data Get

3.1.1 OBD Data

JSON 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

You will periodically receive the related data by default.

JSON 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

You will periodically receive the related data by default.

JSON data:

```json
{
    "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

You will periodically receive the related data by default.

JSON data:

```json
{
    "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

You will periodically receive the related data by default.

JSON data :

```json
{
    "topic":"v1/{client_id}/modem1/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`).

3.2 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	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 JSON data:

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

Response JSON data:

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 request parameter"
    }
}
```

Parameter description, see General Information.

Case 2. Change Only Group Data Uploading Interval

Specify only `interval` field in message body.

Request JSON data:

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

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

Response JSON data:

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 request parameter"
    }
}
```

Parameter description, see General Information.

Case 3. Change only group data interest

Specify only `interest` field in message body.

Request JSON data:

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

Response JSON data:

Success:

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

Failure:

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "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 JSON data:

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

Response JSON data:

Success:

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

Failure:

```
{
    "topic":"v1/{client_id}/{group_name}/set/resp",
    "result":{
        "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 JSON data:

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

Response JSON data:

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 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 JSON data:

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

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

Response JSON data:

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 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 JSON data:

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

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

Response JSON data:

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 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 JSON data:

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

Response JSON data:

Success:

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

Failure:

```json
{
    "topic":"v1/{client_id}/io/set/resp",
    "result":{
        "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 JSON data:

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

Response JSON data:

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 request parameter"
    }
}
```

Parameter description, see General Information.

3.3 On Demand Reserved Group Information Get

3.3.1 OBD Data

Request JSON data:

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

Response JSON data:

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 request parameter"
    }
}
```

Parameter description, reference General Information & OBD Parameters.

3.3.3 GNSS Data

Publish a message to get GNSS data on demand.

Request JSON data :

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

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

Response JSON data :

Success :

```json
{
    "topic":"v1/{client_id}/gnss/refresh/resp",
    "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 :

```json
{
    "topic":"v1/{client_id}/gnss/refresh/resp",
    "result":{
        "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 JSON data:

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

Response JSON data:

Success:

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

```
{
    "topic":"v1/{client_id}/motion/refresh/resp",
    "result":{
        "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 JSON data:

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

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

Response JSON data:

Success:

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

```
{
    "topic":"v1/{client_id}/io/refresh/resp",
    "result":{
        "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 JSON data:

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

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

Response JSON data:

Success:

```json
{
    "topic":"v1/{client_id}/cellular1/refresh/resp",
    "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:

```json
{
    "topic":"v1/{client_id}/cellular1/refresh/resp",
    "result":{
        "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 JSON data:

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

Response JSON data:

Success:

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

```
{
    "topic":"v1/{client_id}/sysinfo/refresh/resp",
    "result":{
        "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 JSON data:

```
{
    "topic": "v1/{client_id}/io/control",
    "payload":{
        "io.DO1": 0,
        "io.DO2": 0,
        "io.DO3": 0
    }
}
```

Response JSON data:

Success:

```
{
    "topic":"v1/{client_id}/io/control/resp",
    "result": {
        "io.DO1": 0,
        "io.DO2": 0,
        "io.DO3": 0
    }
}
```

Failure:

```
{
    "topic":"v1/{client_id}/io/control/resp",
    "result":{
        "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 JSON data:

```
{
    "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 Topic: `v1/{client_id}/group/set/resp`

Response JSON data:

Success:

```
{
   "topic":"v1/{client_id}/group/set/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/set/resp",
    "result":{
        "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 JSON data:

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

Response JSON data:

Success:

```json
{
    "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:

```json
{
    "topic":"v1/{client_id}/group/get/resp",
    "result":{
        "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`

JSON data:

```
{
    "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

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

Request JSON data:

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

Response JSON data:

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 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	

5.2.2 DTC event Types

Event Name	Event Type	Description	Level	Note
OBDII DTC	OBDII_DTC_{dtc}	OBDII diagnostic trouble code event.	2	dtc: diagnostic trouble code string. see OBD-II DTC
J1939 DTC	J1939_DTC_{spn}	J1939 diagnostic trouble code event.	2	spn: see J1939 DTC

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
obd.xxx	Additional obd information(if any)				Optional	OBD information associated with the event. see OBD Parameters

5.4 Event examples

5.4.1 General event

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

JSON data:

```json
{
    "topic": "v1/{client_id}/event/notice",
    "payload":{
        "starts_at": 1609901560,
        "status": "raise",
        "type": "IGON",
        "level": 1,
        "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, 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

Event occur:

JSON data:

```json
{
    "topic": "v1/{client_id}/event/notice",
    "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:

JSON data:

```
{
    "topic": "v1/{client_id}/event/notice",
    "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

Event occur:

JSON data:

```json
{
    "topic": "v1/{client_id}/event/notice",
    "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:

JSON data:

```json
{
    "topic": "v1/{client_id}/event/notice",
    "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 2: 2D; 3: 3D 4: GNSS+DR; 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] null: invalid	V	mandatory	n: [1,1]
io.DI{n}	Digital Input n	int	0: low 1: high null: invalid		mandatory	n: [1,4]
io.DI{n}_pullup	Digital Input pullup n	int	0: down 1: up null: invalid		mandatory	n: [1,4]
io.DO{n}	Digital Output n	int	0: low 1: high null: invalid		mandatory	n: [1,3]
io.IGT	Digital Input for ignition signal	int	0: low 1: high null: invalid			

A.4 OBD Parameters

Parameter Name	Description	PGN:SPN of J1939	Type	Range	Units	Optional	Note
obd.ts	The last time the OBD info was updated	N/A	int		s		UNIX timestamp, in seconds since the epoch
obd.vin	Vehicle Identification Number	65260:237	string				
obd.e_load	Engine Load	61443:92	double	[0,250.00] 0: stopped >0: started	%		
obd.c_temp	Engine Coolant Temp	65262:110	int	[-40,215]	℃		
obd.rpm	Engine Speed	61444:190	double	[0,16383.75]	RPM		
obd.speed	Vehicle Speed	65265:84	int	[0,255]	km/h		
obd.f_lvl	Fuel Level	65276:96	double	[0,100.00]	%		
obd.f_rate	Fuel Rate	65266:183	double	[0,3276.75]	l/h		
obd.dtcs	DTC Count	N/A	int	[0,250]			
obd.mil	MIL Status	65227:1213	boolean	0:off 1:on			
obd.b_volt	Battery Voltage	65271:168	double	[0,3212.75]	V		
obd.a_temp	Ambient Air Temp	65269:171	int	[-273,1734]	℃		
obd.o_temp	Engine Oil Temp	65262:175	int	[-273,1734]	℃		
obd.up_time	Engine Start Time	94952:3310	int	[0,65535]	sec		
obd.m_dist	Distance traveled while MIL is Activated	49408:3069	int	[0,65535]	km		
obd.d_dist	Distance traveled since DTCs cleared	49408:3294	int	[0,65535]	km		
obd.m_time	Engine run time while MIL activated	49408:3295	int	[0,65535]	min		
obd.d_time	Engine run time since DTCs cleared	49408:3296	int	[0,65535]	min		
obd.f_press	Fuel Pressure	64929:3480	int	[0,6425]	kPa		
obd.t_pos	Throttle Position	65266:51	double	[0,100.00]	%		
obd.brake	Brake Switch Status	65265:597	boolean	0:brake pedal released 1:brake pedal depressed			
obd.parking	Parking Brake Switch Status	65265:70	boolean	0:parking brake not set 1:parking brake set			
obd.s_w_angle	Steering Wheel Angle	61449:1807	double	[-31.374,31.374]	rad		
obd.f_econ	Fuel Economy	65266:185	double	[0,125.50]	km/L		
obd.odo	Odometer	65248:245	double	[0,526385151.875]	km		
obd.a_pos	Accelerator Pedal Position	61443:91	double	[0,100.00]	%		
obd.t_dist	trip distance	65248:244	double	[0,526385151.875]	km		
obd.i_temp	Intake Manifold Temp	65270:102	int	[-40,215]	℃		
obd.i_press	Intake Manifold Pressure	65270:105	int	[0,255]	kPa		
obd.b_press	Barometirc Pressure	65269:108	int	[0,255]	kPa		
obd.f_r_press	Fuel Rail Pressure	64765:5313	int	[0,65530]	kPa		
obd.r_torque	Engine reference Torque	65251:544	int	[0,64255]	Nm		
obd.f_torque	Engine friction Torque	65247:514	float	[-125.00,125.00]	%		
obd.max_avl_torque	Engine Maximum Available Torque	61443:3357	float	[0,100.00]	%		
obd.a_torque	Engine actual Torque	61444:513	float	[-125.00,125.00]	%		
obd.d_e_f_vol	Diesel Exhaust Fluid Volume	65110:1761	float	[0,100.00]	%		
obd.mf_mon	Misfire Monitor Status	65230:1221	int	0:not completed 1:completed			

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

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 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	[0,3]			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 1: create 2: down 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 modem1 info was updated	int		s		UNIX timestamp, in seconds since the epoch
sysinfo.hostname	hostname	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.product_number	product number	string				
sysinfo.description	description	string				