FlexAPI Reference

For LAN Application

Revision History

Revision	Date	Author	Item(s) changed	Note
1.0.0	15/5/2020	ganjx, wucl, dengzt	Create document.	
1.0.1	28/5/2020	ganjx, wucl, dengzt	Added support: create/update/remove multiple custom groups via single request. - modified **Create/Update custom group** request&response payload. - modified **Remove custom group** request&response payload.	
1.0.2	9/6/2020	ganjx	Removed the leading forward slash of the topics per Chapter 4.7.1.1 of mqtt-v3.1.1.	

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 application integration inside the vehicle(Edge computing).

FlexAPI provides unified data and control service via MQTT topics for LAN access.

For data service, each MQTT topic corresponds to a group of data, and we have ready to use reserved groups such as: GNSS, OBD, Motion, IO 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 subscribe to these topics to get the latest data, and they can also set the data uploading intervals.

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

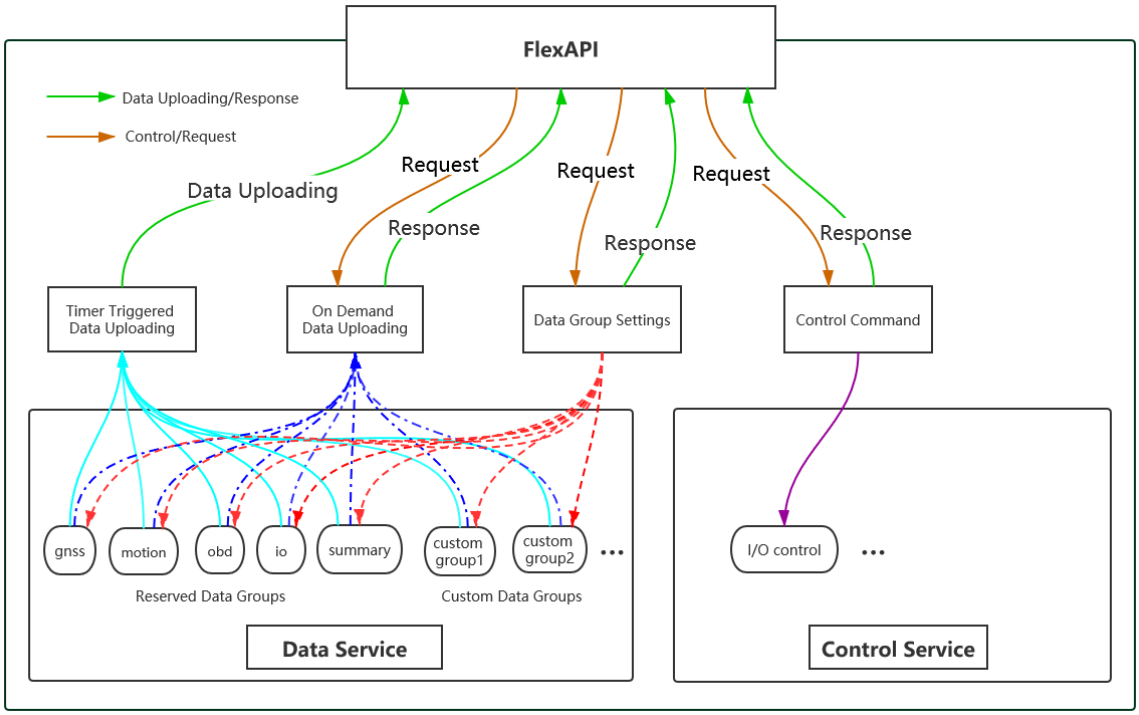
FlexAPI specially provides MQTT topics for users to actively get data on demand.

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

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

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

1.1 Architecture



1.2 MQTT Intro

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

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

For more information, see MQTT.

1.3 MQTT Topics Rules

- Topics are `UTF-8` encoded hierarchical strings. The forward slash (/) is used to separate levels in the topic hierarchy.
- Topic Wildcards:

Wildcard	Description
#	Must be the last character in the topic to which you are subscribing. Works as a wildcard by matching the current tree and all subtrees. For example, a subscription to Sensor/# receives messages published to Sensor/, Sensor/temp,Sensor/temp/room1, but not the messages published to Sensor.
+	Matches exactly one item in the topic hierarchy. For example, a subscription to Sensor/+/room1 receives messages published to Sensor/temp/room1,Sensor/moisture/room1, but not the messages published to Sensor/room1.

1.4 MQTT Broker settings

1.4.1 MQTT Broker address and port.

The local MQTT broker runs on LAN interface(Bridge 1) and listens on port 1085.

1.4.2 MQTT Authentication(Optional)

MQTT client can connect to MQTT broker with username and password pairs or anonymous, it's up to user's choice.

1.4.2.1 Username/Password

In this case, local MQTT broker requires an username and password pairs for authentication.

After a network connection is established by a client to broker, the first packet sent from the client to the broker MUST be a CONNECT packet

The payload must contain username, password and unique client identifier fields. see MQTT CONNECT.

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 subscribe to the response topics, and they request service by publishing a message to the request topics.

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

For Basic Usage, see 3. Basic usage.

For Advanced Usage, see 4. Advanced usage.

For FlexAPI supported Parameters, see Appendix A. FlexAPI supported Parameters.

2.1 FlexAPI Return information and Errors

2.1.1 General information

Parameter Name	Description	Type	Note
client_token	client token	string	A unique string for users to match responses with the corresponding requests.
result	result	object	When the request succeeds, there will be result field in response message body.
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

2.2 FlexAPI supported Topics

2.2.1 Data service

2.2.1.1 Timer triggered reserved group data get

Users can subscribe to the following topics to get the latest data.

Topic	Allowed Operations	Description
v1/summary/info	Subscribe	Timer triggered Summary data uploading. see Summary Data.
v1/obd/info	Subscribe	Timer triggered OBD data uploading. See OBD data.
v1/gnss/info	Subscribe	Timer triggered GNSS data uploading. see GNSS Data.
v1/motion/info	Subscribe	Timer triggered Motion data uploading. see Motion Data.
v1/io/info	Subscribe	Timer triggered IO data uploading. see IO Data.

2.2.1.2 Reserved group settings

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

Topic	Allowed Operations	Description
v1/summary/set	Publish	Set Summary group request. see Summary settings.
v1/summary/set/resp	Subscribe	Set Summary group response.
v1/obd/set	Publish	Set OBD group request. see OBD settings.
v1/obd/set/resp	Subscribe	Set OBD group response.
v1/gnss/set	Publish	Set GNSS group request. see GNSS settings.
v1/gnss/set/resp	Subscribe	Set GNSS group response.
v1/motion/set	Publish	Set Motion group request. see Motion settings.
v1/motion/set/resp	Subscribe	Set Motion group response.
v1/io/set	Publish	Set IO group request. see IO settings.
v1/io/set/resp	Subscribe	Set IO group response.

2.2.1.3 On demand reserved group data get

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

Topic	Allowed Operations	Description
v1/summary/refresh	Publish	Refresh Summary data request. see Summary Data.
v1/summary/refresh/resp	Subscribe	Refresh Summary data response.
v1/obd/refresh	Publish	Refresh OBD data request. see OBD data.
v1/obd/refresh/resp	Subscribe	Refresh OBD data response.
v1/gnss/refresh	Publish	Refresh GNSS data request. see GNSS Data.
v1/gnss/refresh/resp	Subscribe	Refresh GNSS data response.
v1/motion/refresh	Publish	Refresh Motion data request. see Motion Data.
v1/motion/refresh/resp	Subscribe	Refresh Motion data response.
v1/io/refresh	Publish	Refresh IO data request. see IO Data.
v1/io/refresh/resp	Subscribe	Refresh IO data response.

2.2.2 Control Service

2.2.2.1 IO control

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

Topic	Allowed Operations	Description
v1/io/control	Publish	IO control request. see IO Control.
v1/io/control/resp	Subscribe	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/group/set	Publish	Create/Update group request. see Create/Update custom group.
v1/group/set/resp	Subscribe	Create/Update group response.

2.2.3.1.2 Get custom group settings

Topic	Allowed Operations	Description
v1/group/get	Publish	Get group settings request. see Get custom group settings.
v1/group/get/resp	Subscribe	Get group settings response.

2.2.3.1.3 Remove custom group

Topic	Allowed Operations	Description
v1/group/set	Publish	Remove group request. see Remove custom group.
v1/group/set/resp	Subscribe	Remove group response.

2.2.3.2 Timer triggered custom group data get

Topic	Allowed Operations	Description
v1/{group_name}/info	Subscribe	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/{group_name}/refresh	Publish	Refresh group data request. see On demand custom group data get.
v1/{group_name}/refresh/resp	Subscribe	Refresh group data response.

3. Basic usage

3.1 Timer triggered reserved group data get

3.1.1 Summary data

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

Topic: `v1/summary/info`

Payload:


```
{
    "ts" : 1489096425069,
    "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.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
}
```

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

Topic: `v1/obd/info`

Payload:

```
{
    "ts" : 1489096425069,
    "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 subscribed to this topic, you will periodically receive the related data.

Topic: `v1/gnss/info`

Payload:

```
{
    "ts" : 1489096425069,
    "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.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 subscribed to this topic, you will periodically receive the related data.

Topic: `v1/motion/info`

Payload:

```
{
    "ts": 1489096425069,
    "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 subscribed to this topic, you will periodically receive the related data.

Topic: `v1/io/info`

Payload:


```
{
    "ts": 1489096425069,
    "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 & IO Parameters.

Use IO 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.

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

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

Request payload:

```
{
   "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
   "interval": 0
}
```

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

Response Payload:

Success:

```
{
   "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
   "result": {
      "interval": 0
   }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, see General Information.

Case 2. Change only group data uploading interval

Specify only `interval` field in message body.

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

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interval": 60
}
```

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

Response Payload:

Success:


```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interval": 60
    }
}
```


Failure:


```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```


Parameter description, see General Information.

Case 3. Change only group data interest

Specify only `interest` field in message body.

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

Request payload:


```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
}
```


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

Response Payload:

Success:


```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
    }
}
```


Failure:


```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```


Parameter description, see General Information.

Case 4. Change both interest and uploading interval

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

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

Request payload:

```
   {
       "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
       "interval": 60,
       "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
   }
```

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

Response Payload:

Success:

```
   {
       "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
       "result": {
          "interval": 60,
          "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
       }
   }
```

Failure:

```
   {
       "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
       "error": "invalid_parameter",
       "error_desc": "Invalid request parameter"
   }
```

Parameter description, see General Information.

3.2.2 Summary 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 FlexAPI supported Parameters.

Request Topic: `v1/summary/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon", "obd.speed":
"speed", "obd.odo": ""}
}
```

Response Topic: `v1/summary/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interval": 60,
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"obd.speed": "speed", "obd.odo": ""}
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, see General Information.

3.2.3 OBD settings

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

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

Request Topic: `v1/obd/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interval": 60,
    "interest": {"obd.mil": "MIL", "obd.dtcs": "dtcNum", "obd.rpm":
"engineSpeed"}
}
```

Response Topic: `v1/obd/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interval": 60,
        "interest": {"obd.mil": "MIL", "obd.dtcs": "dtcNum", "obd.rpm":
"engineSpeed"}
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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/gnss/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interval": 60,
    "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"gnss.altitude": "alt"}
}
```

Response Topic: `v1/gnss/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interval": 60,
        "interest": {"gnss.latitude": "lat", "gnss.longitude": "lon",
"gnss.altitude": "alt"}
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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/motion/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interval": 60,
    "interest": {"motion.ax": "acceleration_x", "motion.ay": "acceleration_y",
"motion.az": "acceleration_z"}
}
```

Response Topic: `v1/motion/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interval": 60,
        "interest": {"motion.ax": "acceleration_x", "motion.ay":
"acceleration_y", "motion.az": "acceleration_z"}
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, see General Information.

3.2.6 IO settings

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

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

Request Topic: `v1/io/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "interval": 60,
    "interest": {"io.AI1": "ai1", "io.AI2": "ai2", "io.AI3": "ai3"}
}
```

Response Topic: `v1/io/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "interval": 60,
        "interest": {"io.AI1": "ai1", "io.AI2": "ai2", "io.AI3": "ai3"}
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, see General Information.

3.3 On demand reserved group data get

3.3.1 Summary data

Publish a message to get summary data on demand.

Request Topic: `v1/summary/refresh`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

Response Topic: `v1/summary/refresh/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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.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:


```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```


Parameter description, see General Information & FlexAPI supported Parameters.

3.3.2 OBD data

Publish a message to get OBD data on demand.

Request Topic: `v1/obd/refresh`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

Response Topic: `v1/obd/refresh/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "obd.rpm": 34245,
        "obd.speed": 53255
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, reference General Information & OBD Parameters.

3.3.3 GNSS data

Publish a message to get GNSS data on demand.

Request Topic: `v1/gnss/refresh`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

Response Topic: `v1/gnss/refresh/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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.date": "2020-4-17",
        "gnss.time": "10:16:21"
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, reference General Parameter & GNSS Parameters.

3.3.4 Motion data

Publish a message to get motion data on demand.

Request Topic: `v1/motion/refresh`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

Response Topic: `v1/motion/refresh/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "motion.ax": 0.08,
        "motion.ay": 0.0,
        "motion.az": 0.0,
        "motion.gx": 0.15,
        "motion.gy": 0.03,
        "motion.gz": -0.47,
        "motion.roll": -0.65,
        "motion.pitch": 1.03,
        "motion.yaw": 302.49
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, reference General Parameter & Motion Parameters.

3.3.5 IO data

Publish a message to get IO data on demand.

Request Topic: `v1/io/refresh`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

Response Topic: `v1/io/refresh/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "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:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```


Parameter description, reference General Parameter & IO Parameters.

3.4 Control Service

3.4.1 IO Control

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

Request Topic: `v1/io/control`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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
}
```

Response Topic: `v1/io/control/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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/group/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "settings": [{
            "group_name": "group1",
            "interval": 60,
            "interest": {"gnss.latitude": "lat","gnss.longitude":
"lon","gnss.altitude": "alt","obd.speed": "speed","obd.odo": "odo"}
        },{
            "group_name": "group2",
            "interval": 30,
            "interest": {"io.DI1": "DI1","io.DI2": "DI2","io.DI3":
"DI3","io.DI4": "DI4","io.DO1": "DO1","io.DO2": "DO2","io.DO3": "DO3"}
        }
    ]
}
```

Response Topic: `v1/group/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": [{
            "group_name": "group1",
            "interval": 60,
            "interest": {"gnss.latitude": "lat","gnss.longitude":
"lon","gnss.altitude": "alt","obd.speed": "speed","obd.odo": "odo"}
        },{
            "group_name": "group2",
            "interval": 30,
            "interest": {"io.DI1": "DI1","io.DI2": "DI2","io.DI3":
"DI3","io.DI4": "DI4","io.DO1": "DO1","io.DO2": "DO2","io.DO3": "DO3"}
        }
    ]
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```


Parameter description, see General Information & General settings.

4.1.2 Get custom group settings

Use the following topics to get custom group settings.

Request Topic: `v1/group/get`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

Response Topic: `v1/group/get/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": [{
        "group_name": "group1",
        "interval": 60,
        "interest": {"gnss.latitude": "lat","gnss.longitude":
"lon","gnss.altitude": "alt","obd.speed": "speed","obd.odo": "odo"}
    },{
        "group_name": "group2",
        "interval": 30,
        "interest": {"io.DI1": "DI1","io.DI2": "DI2","io.DI3": "DI3","io.DI4":
"DI4","io.DO1": "DO1","io.DO2": "DO2","io.DO3": "DO3"}
    }]
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, see General Information & General settings.

4.1.3 Remove custom group

Use the following topics to remove group.

Request Topic: `v1/group/set`

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "settings": [{
            "group_name": "group1",
            "interest": null
        },{
            "group_name": "group2",
            "interest": null
        }
    ]
}
```

Response Topic: `v1/group/set/resp`

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": [{
            "group_name": "group1",
            "interest": null
        },{
            "group_name": "group2",
            "interest": null
        }
    ]
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "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/{group_name}/info`

Payload:

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

Parameter description, see General Information & FlexAPI supported Parameters.

4.3 On demand custom group data get

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

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

Request payload:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J"
}
```

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

Response Payload:

Success:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "result": {
        "lat": 40.232213,
        "ai1": 1.0,
        "obd.speed": 50
    }
}
```

Failure:

```
{
    "client_token": "3bzJQ2OOUkLS6O6lMhW3muUv73ycUT7J",
    "error": "invalid_parameter",
    "error_desc": "Invalid request parameter"
}
```

Parameter description, see General Information & FlexAPI supported Parameters.

Appendix A. FlexAPI supported Parameters

A.1 GNSS Parameters

Parameter Name	Description	Type	Range	Units	Optional	Note
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.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.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.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.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]

A.4 OBD Parameters

Parameter Name	Description	Type	Range	Units	Optional	Note
obd.vin	Vehicle Identification Number	string				
obd.e_load	Engine Load	double	[0,250] 0: stopped >0: started	%		
obd.c_temp	Engine Coolant Temp	int	[-40,215]	℃		
obd.rpm	Engine Speed	double	[0,16383.75]	RPM		
obd.speed	Vehicle Speed	int	[0,255]	km/h		
obd.f_lvl	Fuel Level	double	[0,100]	%		
obd.f_rate	Fuel Rate	double	[0,3276.75]	l/h		
obd.dtcs	DTC Count	int	[0,250]			
obd.mil	MIL Status	boolean	0:off 1:on			
obd.b_volt	Battery Voltage	double	[0,3212.75]	V		
obd.a_temp	Ambient Air Temp	int	[-273,1734]	℃		
obd.o_temp	Engine Oil Temp	int	[-273,1734]	℃		
obd.up_time	Engine Start Time	int	[0,65535]	sec		
obd.m_dist	Distance traveled while MIL is Activated	int	[0,65535]	km		
obd.d_dist	Distance traveled since DTCs cleared	int	[0,65535]	km		
obd.m_time	Engine run time while MIL activated	int	[0,65535]	min		
obd.d_time	Engine run time since DTCs cleared	int	[0,65535]	min		
obd.f_press	Fuel Pressure	int	[0,6425]	kPa		
obd.t_pos	Throttle Position	double	[0,100]	%		
obd.brake	Brake Switch Status	boolean	0:brake pedal released 1:brake pedal depressed			
obd.parking	Parking Brake Switch Status	boolean	0:parking brake not set 1:parking brake set			
obd.s_w_angle	Steering Wheel Angle	double	[-31.374,31.374]	rad		
obd.f_econ	Fuel Economy	double	[0,125.50]	km/L		
obd.odo	Odometer	double	[0,526385151.875]	km		
obd.a_pos	Accelerator Pedal Position	double	[0,100]	%		
obd.t_dist	trip distance	double	[0,526385151.875]	km		
obd.i_temp	Intake Manifold Temp	int	[-40,215]	℃		
obd.i_press	Intake Manifold Pressure	int	[0,255]	kPa		
obd.b_press	Barometirc Pressure	int	[0,255]	kPa		

Parameter Name	Description	Type	Range	Units	Optional	Note
obd.f_r_press	Fuel Rail Pressure	int	[0,65530]	kPa		
obd.r_torque	Engine reference Torque	int	[0,64255]	Nm		
obd.f_torque	Engine friction Torque	flat	[-125,125]	%		
obd.max_avl_torque	Engine Maximum Available Torque	float	[0,100]	%		
obd.a_torque	Engine actual Torque	float	[-125,125]	%		
obd.d_e_f_vol	Diesel Exhaust Fluid Volume	float	[0,100]	%		
obd.mf_mon	Misfire Monitor Status	int	0:not completed 1:completed			
obd.f_s_mon	Fuel System Monitor Status	int	0:not completed 1:completed			
obd.c_c_mon	Comprehensive Component Monitor Status	int	0:not completed 1:completed			
obd.c_mon	Catalyst Monitor Status	int	0:not completed 1:completed			
obd.h_c_mon	Heated Catalyst Monitor Status	int	0:not completed 1:completed			
obd.e_s_mon	Evaporative System Monitor Status	int	0:not completed 1:completed			
obd.s_a_s_mon	Secondary Air System Monitor Status	int	0:not completed 1:completed			
obd.a_s_r_mon	A/C System Refrigerant Monitor Status	int	0:not completed 1:completed			
obd.e_g_s_mon	Exhaust Gas Sensor Monitor Status	int	0:not completed 1:completed			
obd.e_g_s_h_mon	Exhaust Gas Sensor heater Monitor Status	int	0:not completed 1:completed			
obd.e_v_s_mon	EGR/VVT System Monitor Status	int	0:not completed 1:completed			
obd.c_s_a_s_mon	Cold Start Aid System Monitor Status	int	0:not completed 1:completed			
obd.b_p_c_s_mon	Boost Pressure Control System Monitor Status	int	0:not completed 1:completed			
obd.dpf_mon	DPF Monitor Status	int	0:not completed 1:completed			
obd.n_c_mon	NOx Catalyst Monitor Status	int	0:not completed 1:completed			
obd.nmhc_mon	NMHC Catalyst Monitor Status	int	0:not completed 1:completed			

Parameter Name	Description	Type	Range	Units	Optional	Note
obd.o_s_mon	Oxygen Sensor Monitor Status	int	0:not completed 1:completed			
obd.o_s_h_mon	Oxygen Sensor heater Monitor Status	int	0:not completed 1:completed			
obd.pf_mon	PF Monitor Status	int	0:not completed 1:completed			
obd.brake_prim_press	Brake Primary Pressure	float		kPa		
obd.brake_sec_press	Brake Secondary Pressure	float		kPa		