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Omni Interface Protocol

-MQTT.JSON&BLE-V1.1.8

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V1.1.3	08/10/2023	Add time_period in < Setting Audio Parameters>	
V1.1.4	16/10/2023	A>ADD Bike Voice: (string length :8) Refer audio set. B>change Rfid event report format (refer om/client/data/rfid-event) c> add ble version	
V1.1.5	18/10/2023	A>Add Geofence setting, refer Setting IoT Global Parameters b> add new topic <Reporting Entering and Exiting Geofences Events> c> add periodPosgap feature.	
V1.1.6	1/11/2023	1>add query beacon info	
V1.1.7	3/7/2024	1>add reboot command for ble	
V1.1.8	11/11/2025	1》 change parameter in topic <Setting Audio Parameters>	

Notice:

Not all products include all the functions defined in the protocol. Specific differentiation is required based on product type.

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1. Protocol Specification

1.1. Communication Method

MQTT protocol is used as the transport layer for communication between devices and the servers, and user name and password authentication shall be opened for MQTT server. The quality of service for sending messages between devices and servers is 1 (QoS = 1), which ensures that the message is delivered for at least one time and the message content is in the format of JSON.

QoS level description:

QoS 1 includes a simple retransmission mechanism. After sending the message, the sender waits for the receiver's ACK. If the ACK is not received, the message will be retransmitted. This mechanism ensure that the message will be delivered at least once, while it does not guarantee that the message is repeated,

1.2. Subject Name

Description:

1. IMEI: IOT unique identification code;

2. The uniform template for all subject om/{server,client}/{req,res,data}/{name}/{IMEI}

All subjects related to the protocol are listed as follows. The client cannot receive the message of the topic unless he/she subscribes the corresponding topic.

Messages can be divided into four categories: device registration and heartbeat / parameter configuration / control query / data reporting / device upgrade.

Device registration and heartbeat:

```
om/server/req/set-time/{IMEI}
om/server/res/set-time/{IMEI}
om/client/req/register/{IMEI}
om/server/res/register/{IMEI}
om/client/data/sign/{IMEI}
om/client/req/heartbeat/{IMEI}
om/server/res/heartbeat/{IMEI}
```

Parameter configuration:

```
om/server/req/set-network/{IMEI}
om/client/res/set-network/{IMEI}
om/server/req/set-tracking/{IMEI}
om/client/res/set-tracking/{IMEI}
om/server/req/set-ble/{IMEI}
om/client/res/set-ble/{IMEI}
om/server/req/set-audio/{IMEI}
om/client/res/set-audio/{IMEI}
om/server/req/set-heartbeat/{IMEI}
om/client/res/set-heartbeat/{IMEI}
om/server/req/set-global/{IMEI}
om/client/res/set-global/{IMEI}
om/server/req/set-rfid/{IMEI}
om/client/res/set-rfid/{IMEI}
om/server/req/set-led/{IMEI}
om/client/res/set-led/{IMEI}
om/server/req/set-ecu/{IMEI}
om/client/res/set-ecu/{IMEI}
```

Control query:

```
om/server/req/send-rto/{IMEI}
om/client/res/send-rto/{IMEI}
om/server/req/send-query/{IMEI}
om/client/res/send-query/{IMEI}
```

om/server/req/transparent/{IMEI}
om/client/res/transparent/{IMEI}

Data reporting:

om/client/data/location/{IMEI}
om/client/data/global-config/{IMEI}
om/client/data/ecu-config/{IMEI}
om/client/data/vehicle-info/{IMEI}
om/client/data/versn-info/{IMEI}
om/client/data/bms-info/{IMEI}
om/client/data/alarm-info/{IMEI}
om/client/data/rfid-info/{IMEI}
om/client/data/lock-event/{IMEI}
om/client/data/rfid-event/{IMEI}
om/client/data/simcard-info/{IMEI}
om/client/data/network-event/{IMEI}
om/client/data/user-behavior/{IMEI}

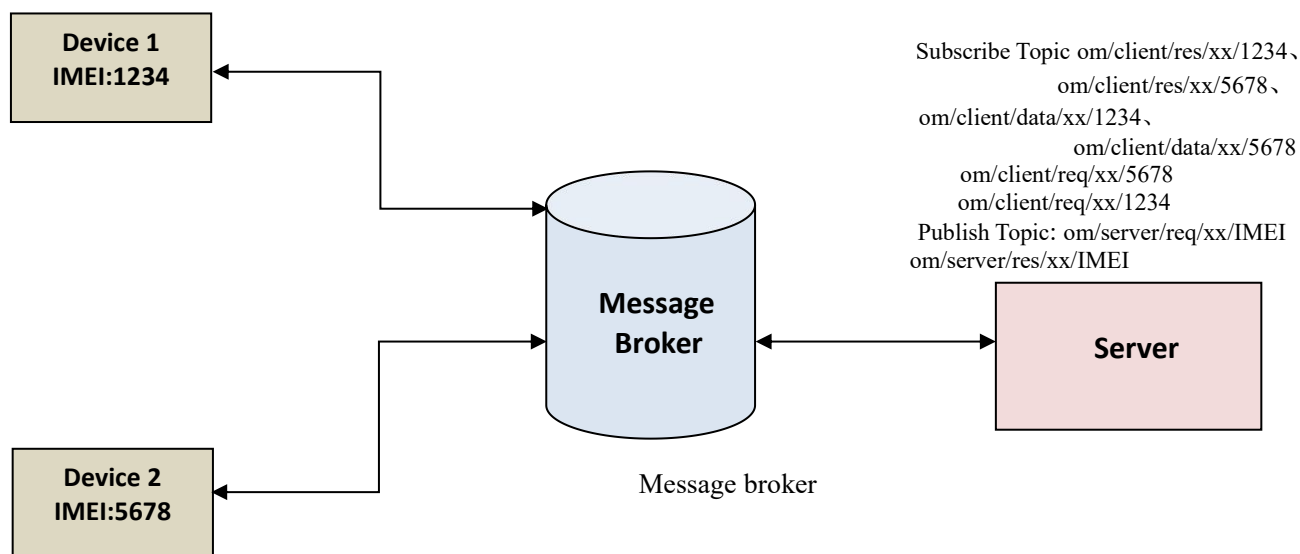
Device upgrade:

om/server/req/ota-upgrade/{IMEI}
om/client/res/ota-upgrade/{IMEI}
om/client/data/ota-info/{IMEI}

1.3. Architecture Overview

Subscribe Topic: om/server/req/xx/1234
om/server/res/xx/1234

Publish Topic: om/client/res/xx/1234
om/client/data/xx/1234
om/client/req/xx/1234



Subscribe Topic: om/server/req/xx/1234
om/server/res/xx/1234

Publish Topic: om/client/res/xx/1234
om/client/data/xx/1234
om/client/req/xx/1234

2. Message Details

Note: when a server or a device only needs some functions of a command, the redundant keys and values can be removed from the message content, and only the required function parameters are retained.

2.1. Equipment Registration and Heartbeat

2.1.1. Equipment Registration

Description:

(The device registration timeout is 30s, and the registration request will be sent again if the first attempt fails.)

Note:deviceName is the IMEI of IOT. productKey and deviceSecret is assigned by OM server.

Message Topic:

- device -> server Topic name: om/client/req/register/{IMEI}
- server-> device Topic name: om/server/res/register/{IMEI}

device > server data example:

```
{
  "deviceType": "Scooter",
  "protVersion": "1.0.0",
  "operationId": 1860,
  "HardwareType": "M113",
  "register": {
    "productKey": "orrcfhwg",
    "deviceName": "864475045545158",
    "deviceSecret": "797ae339850e2877"
  }
}
```

server -> device data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-parameter	Type	Length	Description
deviceType		string	<10	Name of the category of the vehicle, such as Scooter, Ebike, HorseLock default Scooter
protVersion		string	4-20	Air Interface Protocol version number. When the device is registered, it is used by the server to check whether the protocol version used by the currently connected device is compatible. If not, an error ID can be returned.
HardwareType		string	4-20	The product hardware type example:M113/M128/M136 ..
register	productKey	string	<32	Automatically generated product category number when a certain type of product is created on the server. This number can be burned on the device before leaving the factory.
	deviceName	string	15-17	Product name. Each device has a unique name. IMEI is used here.
	deviceSecret	string	32	The device key is generated by the server in advance, and each device is burned with a unique device key before leaving the factory.
operationId		integer		Operation ID 0-65535

timestamp		string	10	Server return the current timestamp.
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.1.2. Device Check-in

Description:

The device will send such a message as soon as it is connected or reconnected to the server. The server does not need to return any result.

Message Topic:

• device -> server Topic name: om/client/data/sign/{IMEI}

device -> server data example:

```
{
  "sign": {
    "IoTVpc":90,
    "sysSoc":45,
    "CSQ":30,
    "MCC": " 111",
    "MNC": " 121",
    "LAC": " 11FF",
    "CELLID": " 10107734",
    "MAC": " 8C:59:DC:F1:18:0B"
  },
  "timestamp": " 1599206433"
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
sign	IoTVpc	integer		IOT Voltage Percent: 0-100
	sysSoc	integer		Scooter battery percentage 0%- 100%
	CSQ	integer		Current network signal value, ranges from 2 to 32. The larger the value, the better the signal.
	MCC	string	< 4	Mobile country code
	MNC	string	< 4	Mobile Network Code
	LAC	string	4	“11FF” position code two byte hexadecimal number
	CELLID	string	<= 8	"10107734" CELL ID decimal digit character
	MAC	string	17	"8C: 59: DC: f1:18:0B" MAC address data
timestamp		string	10	"1599206433" timestamp

2.1.3. Equipment Heartbeat

Description:

When a device stay connected to the server, this message is uploaded every 4 minutes by default. Parameters such as heartbeat interval can be configured.

Message Topic:

- device -> server Topic name: om/client/req/heartbeat/{IMEI}
- server-> device Topic name: om/server/res/heartbeat/{IMEI}

device -> server data example:

```
{
  "heartbeat": {
    "lockSta":0,
    "IoTVpc":90,
    "CSQ":30,
    "sysSoc":80,
    "errorCode":30,
    "charging":0
  },
  "timestamp":" 1599206433"
}
```

server -> device data example:

```
{
  "code": 200
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Description
heartbeat	lockSta	integer	Scooter status: 0->unlocked, 1->locked
	IoTVpc	integer	IOT Voltage Percent: 0-100
	CSQ	integer	Current network signal value, ranges from 2 to 32. The larger the value, the better the signal.
	sysSoc	integer	Battery percentage of scooter/ebike/horselock
	errorCode	integer	Error code
	charging	integer	charging status 0-Not charging 1-Charging
timestamp		string	"1599206433" timestamp

2.2. Parameter configuration

2.2.1. Setting IoT Network Parameters

Description:

Set IoT network parameters.

Message Topic:

- server -> device Topic name: om/server/req/set-network/{IMEI}
- device -> server Topic name: om/client/res/set-network/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "networkInfo":
  {
    "serverAddr": "202.104.62.38",
    "serverPort": "1883",
    "apnName": "CMNET",
    "apnUserName": "0",
    "apnPassword": "0",
    "loginName": "xx",
    "loginPswd": "xx"
  },
  "timestamp": "1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server; Range: 0-65535
networkInfo	serverAddr	string	<64	Server address, domain name or IP address
	serverPort	string	<6	Port number 0-65535
	apnName	string	<10	APN
	apnUserName	string	<10	APN user
	apnPassword	string	<10	APN password
	loginName	string	<80	Server login name (no list mqtt message)
	loginPswd	string	<48	Server login password (no list in mqtt message)
timestamp		string	10	"1599206433" timestamp

code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes
------	--	---------	--	--

2.2.2. Setting Position Track Parameters

Description:

Set position tracking parameters. When trackingset set 1, the gps module will keep open. If no need use track, pls use periodPosgap, it will close gps module after periodPosgap.

Message Topic:

- server -> device Topic name: om/server/req/set-tracking/{IMEI}
- device -> server Topic name: om/client/res/set-tracking/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "trackingSet":
  {
    "trackingEn": 1,
    "lockSDgap": 0,
    "unlockSDgap": 60,
    "backupSDgap": 240
  },
  "periodPosgap": 60,
  "timestamp": "1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server, range: 0-65535
trackingSet	trackingEn	integer		Position tracking 0 - Disabled 1- Enabled (default)
	lockSDgap	integer		Time interval for sending positioning coordinates when the device is locked; Unit: S; Range: 1-65535 0 (default)
	unlockSDgap	integer		Time interval for sending positioning coordinates when the device is locked; Unit: S; Range: 1-65535 60 (default)
	backupSDgap	integer		Time interval for sending positioning coordinates when the device is powered by the backup battery; Unit: S; Range: 1-65535 600 (default)
periodPosgap		integer		Period report position gap, it will close gps module after periodPosgap. unit: 5-720 min Default 60 min.
timestamp		string	10	"1599206433" timestamp

code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes
------	--	---------	--	--

2.2.3. Setting Bluetooth Parameters

Description:

Set Bluetooth parameters.

Message Topic:

- server -> device Topic name: om/server/req/set-ble/{IMEI}
- device -> server Topic name: om/client/res/set-ble/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "bleSet": {
    "key": "yOTmK50z", (reserved)
    "name" : "Lock"
  },
  "timestamp": "1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server, range: 0-65535
bleSet	key	string	8	Set Bluetooth key " yOTmK50z "(Default)
	name	string	<=10	Set Bluetooth name "Lock" (default)
timestamp		string	10	"1599206433" timestamp
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.2.4. Setting Audio Parameters

Description:

Set audio parameters.

Message Topic:

- server -> device Topic name: om/server/req/set-audio/{IMEI}
- device -> server Topic name: om/client/res/set-audio {IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "audioSet":
  {
    "enable": 0,
    "norVol" :1,
    "mask": "1101010010111"
  },
  "timestamp":" 1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp":" 1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description																											
operationId		integer		Operation random number generated by the server, range: 0-65535																											
audioSet	enable	integer		Is voice prompt enabled 1 - Enable voice prompt (default) 0 - Disable voice prompt																											
	norVol	integer		Ordinary volume; Default volume; For Scooter/horselock/bike:Range: 1-15 1-Min; 15-max (default-10)																											
	mask	string	8	Audio mask, which controls the enabling switch of device’s audio; meaning of corresponding position: 0- Disable 1- Enable Notice: Differnt iot has different sound voice. Rabit Voice: (string length :13) <table><tr><td>Position serial number</td><td>type</td></tr><tr><td>1</td><td>SOUND POWERON</td></tr><tr><td>2</td><td>SOUND POWERDOWN</td></tr><tr><td>3</td><td>SOUND UNLOCK</td></tr><tr><td>4</td><td>SOUND LOCK</td></tr><tr><td>5</td><td>SOUND WARNING IOTOUT</td></tr><tr><td>6</td><td>SOUND WARNING MOVE</td></tr><tr><td>7</td><td>SOUND APP FINDCAR</td></tr><tr><td>8</td><td>SOUND WARNING OUTSIDE</td></tr><tr><td>9</td><td>SOUND WARNING LOW POWER</td></tr><tr><td>10</td><td>SOUND SCOOTER WILLOFF</td></tr><tr><td>11</td><td>SOUND NEAR MAXRIDETIME</td></tr><tr><td>12</td><td>SOUND MAXRDETIMEARRIVE</td></tr><tr><td>13</td><td>CABLE LOCK ISLOCK</td></tr></table>	Position serial number	type	1	SOUND POWERON	2	SOUND POWERDOWN	3	SOUND UNLOCK	4	SOUND LOCK	5	SOUND WARNING IOTOUT	6	SOUND WARNING MOVE	7	SOUND APP FINDCAR	8	SOUND WARNING OUTSIDE	9	SOUND WARNING LOW POWER	10	SOUND SCOOTER WILLOFF	11	SOUND NEAR MAXRIDETIME	12	SOUND MAXRDETIMEARRIVE	13
Position serial number	type																														
1	SOUND POWERON																														
2	SOUND POWERDOWN																														
3	SOUND UNLOCK																														
4	SOUND LOCK																														
5	SOUND WARNING IOTOUT																														
6	SOUND WARNING MOVE																														
7	SOUND APP FINDCAR																														
8	SOUND WARNING OUTSIDE																														
9	SOUND WARNING LOW POWER																														
10	SOUND SCOOTER WILLOFF																														
11	SOUND NEAR MAXRIDETIME																														
12	SOUND MAXRDETIMEARRIVE																														
13	CABLE LOCK ISLOCK																														

timestamp		string	10	"1599206433" timestamp
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.2.5. Setting Heartbeat Parameters

Description:

Set heartbeat parameters.

Message Topic:

- server -> device Topic name: om/server/req/set-heartbeat/{IMEI}
- device -> server Topic name: om/client/res/set-heartbeat/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "heartbeatSet":
  {
    "interval": 240
  },
  "timestamp": "1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Attribute	Type	Description
operationId		integer	Operation random number generated by the server, range: 0-65535
heartbeatSet	interval	integer	The unit of heartbeat interval: S; Max. value: 3600s; Default: 240s
timestamp		string	Length:10 "1599206433"
code		integer	Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.2.6. Setting IoT Global Parameters

Description:

Set IoT global parameters.

Message Topic:

- server -> device Topic name: om/server/req/set-global/{IMEI}
- device -> server Topic name: om/client/res/set-global/{IMEI}

server -> device data example:

```

{
  "operationId": 1860,
  "unlockReportSet":
  {
    "enable":1,
    "reportGap":20
  },
  "geofenceSet":
  {
    "enable":1,
    "unlockValid":1
  },
  "movementSet":
  {
    "enable": 1,
    "sensitivityLevel" :1,
  },
  "beaconSet":1,
  "timestamp":" 1599206433"
}

```

device -> server data example:

```

{
  "code": 200,
  "timestamp":" 1599206433",
  "operationId": 1860
}

```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server, range: 0-65535
unlockReportSet	enable	integer		Vehicle info report switch, Note: When set enabled, vehicle will report information(Vehicle Information Reporting) 0 - Disabled (default) 1 - Enabled
	reportGap	integer		The unit of report interval: S; Max. value: 3600s; Default: 10s
beaconSet		integer		Enable or disable scan beacon function 0 - Disabled (default) 1 - Enabled
movementSet	enable	integer		Whether to enable the movement detection alarm 0 - Disable 1 - Enable (default)
	sensitivityLevel	integer		Sensitivity level 1 - Low 2 - Medium (default) 3 - High.
geofenceSet	enable	integer		Geofence switch, Note: When geofence is disabled, geofence data will be forcibly cleared. When geofence file is in OTA, this function will be temporarily disabled.

				0 - Disabled 1 - Enabled (default)
	unlockValid	integer		Determine if the geofence is enabled only when the device is unlocked. 0 - NO 1 - Yes (default)
timestamp		string	10	"1599206433"
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.2.7. Setting RFID Parameters

Description:

Setting rfid Parameters (only support the IOT which have RFID function)

Message Topic:

- server -> device Topic name: om/server/req/set-rfid/{IMEI}
- device -> server Topic name: om/client/res/set-rfid/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "rfidSet": {
    "enable": 1,
    "cardOperate": 1,
    "rfidCard": "25652587547ADADF"
  },
  "timestamp": "1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "operateResult": 1,
  "rfidCard": "25652587547ADADF",
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server, range: 0-65535
rfidSet	enable	integer		Card reading enable 0- Disable card reading 1- rfid works in reader/writer mode
	cardOperate	integer		0- No operation 1- add rfid card by cardID 2- Add rfid card by swipe card 3-Delete rfid card 4-Delete all rfid card (when delete all cards,rfidCard will be ignore)

	rfidCard	string	<=32	Rfid Card info; 32 hex characters
operateResult		integer		operateResult: When cardOperate is 1 or 2,it may return 0- Start to read card 1- Add card success 2- Add card fail 3- Card exist When cardOperate is 3 or 4,it may return 1-delete card success 2-Delete card fail (cannot find this card)
rfidCard		string	<=32	Rfid Card info; 32 hex characters
timestamp		string	10	"1599206433"
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.2.8. Set Vehicle-End Parameters

Description:

Set vehicle-end parameters.(only support the IOT communicate with ECU)

Message Topic:

- server -> device Topic name: om/server/req/set-ecu/{IMEI}
- device -> server Topic name: om/client/res/set-ecu/{IMEI}

server -> device data example:

```
{
  "operationId":1860,
  "speedSet":
  {
    "speedMode": 1,
    "lowSpeed":6,
    "midSpeed":6,
    "highSpeed":6,
    "speedUnit":1,
    "cruiseControl":0
  },
  "assistEn": 1,
  "climbEn": 1,
  "lockMotor": 1,
  "shiftGears": 1,
  "controlLed": 1,
  "startupMode": 1,
  "QRCode" : " 25652587547ADADF",
  "timestamp":" 1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp":" 1599206433",
}
```

```

"operationId": 1860
}

```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server; Range: 0-65535
speedSet	speedMode	integer		speedMode (FOR SCOOTER) 1 - ECO (lowSpeed) 2 - NORMAL(midSpeed) 3 - SPORT (highSpeed) speedMode (FOR Ebike) 1 - Exercise 2 - ECO 3-TURBO
	lowSpeed	integer		Range of low-speed mode: 0-25km/h; Default: 10 km/h.
	midSpeed	integer		Range of middle-speed mode: 0-25km/h; Default: 15km/h.
	highSpeed	integer		Range of high-speed mode: 0-25km/h; Default: 20 km/h
	speedUnit	integer		imperial units Mode 1- Enable 0 - Disable (default)
	cruiseControl	integer		Cruise Mode 1-Enable 0 - Disable (default)
assistEn		integer		Enable push assist 1- Enable boost (default) 0 - Do not enable
climbEn		integer		Enable climb assist 1- Enable 0 - Do not enable
QRCode		string	<=32	Virtual QR code maximum 32 characters
lockMotor		integer		Lock Motor function (not allow motor rotate) 1- Enable 0 - Do not enable
shiftGears		integer		shiftGears function by button 1-Enable 0 - Do not enable
controlLed		integer		controlLed function by button 1-Enable 0 - Do not enable
startupMode		integer		0: do not set 1: non zero start 2: zero start
timestamp		string	10	"1599206433"
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.3. Control Query

2.3.1. Real Time Control

Description:

After receiving the real-time control command, the device will immediately return the response to the message, and then report the corresponding data according to different control commands.

Message Topic:

- server -> device Topic name: om/server/req/send-rto/{IMEI}
- device -> server Topic name: om/client/res/send-rto/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "accCTL": 1,
  "lightCTL":
  {
    "headLight": 1 ,
    "rearLight": 1 ,
  },
  "audioCTL": (reserved)
  {
    "type": 1 ,
    "audioFile": 1
  },
  "lookEB": 1,
  "beepAlarm": 1, (reserved)
  "lockCTL":
  {
    "vehicleLock": 1,
    "batLock": 1 ,
    "cableLock": 1 ,
    "helmetLock": 1 ,
    "hubLock": 1
  },
  "moveVehicle":1
  "vehicleCTL": 1,
  "iotCfgReset": 1,
  "timestamp": " 1599206433"
}
```

device -> server data example:

```
{
```

```

"code": 200,
"timestamp": "1599206433",
"operationId": 1860
}

```

Parameter Description:

Parameter	Sub-Parameter	Type	Length	Description
operationId		integer		Operation random number generated by the server, range: 0-65535
accCTL		integer		Throttle control 0- Turn off the throttle 1- Turn on the throttle
lightCTL	headLight	string	2	Headlight control Mode 0: Off 1: Always on 2: Flashing
	rearLight	string	2	Rearlight control Mode 0: Off 1: Always on (reserved) 2: Flashing
lockCTL	vehicleLock	integer		Scooter lock 0 - Disable 1 - Enable
	batLock	integer		Battery lock (disable cmd is invalid for battery lock) 0 - Disable 1 - Enable
	cableLock	integer		Cable lock (disable cmd is invalid for cable lock) 0 - Disabled 1 - Enable
	helmetLock (reserved)	integer		Helmet lock (disable cmd is invalid for helmet lock) 0 - Disable 1 - Enable
	hubLock -reserved	integer		Hub lock (disable cmd is invalid for Hub lock) 0 - Disable 1 - Enable
audioCTL	type	integer		Audio playback 0 - Stop 1 - Play Note: No data reporting
	audioFile	integer		The file number of the audio to be played/stopped playing. Refer to AUDIO SET for the audio file number.
vehicleCTL		integer		Vehicle operation 0 - Power off (reserved) 1 - Power on (reserved) 2 - Restart

				3 -The vehicle power off and enters the transportation mode Note: No data reporting
lookEB		integer		Find vehicle. The value is 1 (default)
beepAlarm		integer		Start beep alarm . 1: start beep 0: close beep
iotCfgReset		integer		1 : reset iot configuration Include heart gap , tracker gap ,unlock report gap
timestamp		string	10	"1599206433"
code		integer		Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.3.2. Information Query

Description:

After receiving the information query command, the device will immediately return the response to the message, and then report the corresponding report message. (support maximum query 5 type data)

Message Topic:

- server -> device Topic name: om/server/req/send-query/{IMEI}
- device -> server Topic name: om/client/res/send-query/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "bsmInfo": 1,
  "verSNInfo": 1,
  "scooterInfo": 1,
  "globalConfig": 1,
  "ecuConfig": 1,
  "gpsInfo": 1,
  "simcardState": 1,
  "networkInfo": 1,
  "rfidInfo": 1,
  "timestamp": "1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter	Sub-Parameter	Type	Description
-----------	---------------	------	-------------

operationId		integer	Operation random number generated by the server, range: 0-65535
bsmInfo		integer	Acquire BSM information -- reserved 1 - (default) Report message subject om/client/data/bms-info/{IMEI}
verSNInfo		integer	Query VER and SN version information 1 - (default) Report message subject om/client/data/versn-info/{IMEI}
scooterInfo		integer	Acquire scooterInfo data 1 - (default) Report message subject om/client/data/scooter-info/{IMEI}
globalConfig		integer	Acquire global configuration information 1 - (default) Report message subject om/client/data/global-config/{IMEI}
ecuConfig		integer	Acquire ECU configuration information 1 - (default) Report message subject om/client/data/ecu-config/{IMEI}
gpsInfo		integer	Single acquisition of GPS positioning 1 - (default) Report message subject om/client/data/location/{IMEI}
simcardState		integer	SIM card status query om/client/data/simcard-info/{IMEI} 1-default
rfidInfo		integer	rfidInfo card query om/client/data/rfid-info/{IMEI} It will return all the rfid cards saved in lock.
timestamp		string	10 "1599206433"
code		integer	Returned result. 200 means success. For others, refer to Appendix I: Error Codes

2.3.3. Data Transparent Transmission

Description:

Data transmission service. The device will directly forward the data received from the server to the ECU and the data returned by the ECU to the server. (**reserved**)

Message Topic:

- server -> device Topic name: om/server/req/transparent/{IMEI}
- device -> server Topic name: om/client/res/transparent/{IMEI}

FOR SCOOTER:

server -> device data example:

```
{
  "dstID": "1A10",
  "index": "A0A1",
  "subIndex": "C0",
  "rwFlag": 1,
```

```

"tranSend": "11223546F1254122"
"timestamp": "1599206433",
}

```

device -> server data example:

```

{
  "srcID": "1B10",
  "rwFlag": 1,
  "index": "A0A1",
  "subIndex": "C0",
  "tranReply": "5013E2001100E81FF",
  "result": 1
}

```

FOR EBIKE:

server -> device data example:

```

{
  "dstID": "1A",
  "cmd": "10",
  "index": "A0",
  "tranSend": "11223546F1254122"
}

```

device -> server data example:

```

{
  "srcID": "1B",
  "cmd": "10",
  "index": "1A",
  "tranReply": "5013E2001100E81FF",
  "result": 1
}

```

FOR SCOOTER:

Parameter Description:

Parameter	Type		Description
dstID	string	4	Target ID, hexadecimal data, up to two bytes
srcID	string	4	Source ID, hexadecimal data, up to two bytes
index	string	4	Index address, hexadecimal data, maximum two bytes
subIndex	hexadecimal	2	Sub index address, hexadecimal data, maximum 1 byte
rwFlag	integer		Read-write mark 0-read data 1-write data
tranSend	string	<=128	The transparent data sent by the server, the length of the hexadecimal character data is less than or equal to 128

result	integer		Return result, transparent result 0-Fail 1-success
tranReply	string	<=128	The length of the reported transparent data is less than 128. Valid when rwFlag is 0

FOR EBIKE:

Parameter Description:

Parameter	Type		Description
dstID	string	4	Target ID, hexadecimal data, up to one byte
cmd	string	4	cmd, hexadecimal data, up to one byte
index	string	4	Index address, hexadecimal data, maximum two bytes
tranSend	string	<=512	The transparent data sent by the server, the length of the hexadecimal character data is less than or equal to 512
result	integer		Return result, transparent result 0-Fail 1-success
tranReply	string	<=512	The length of the reported transparent data is less than 512. Valid when rwFlag is 0

2.4. Data Reporting

2.4.1. Vehicle Positioning Data Reporting

Description:

The device reports positioning data. After enabling the location service, the device will report the current GPS positioning information at a specified time. It can send up to 5 pieces of GPS data at a time maximum.

Message Topic:

• device -> server Topic name: om/client/data/location/{IMEI}

device > server data example:

```
{
  "location":
  [
    {
      "LNG": "114.123456",
      "LAT": "-39.445566",
      "GEO_NS": "N",
      "GEO_EW": "E",
      "gpsNum": "03",
      "hdop": "1.49",
      "timestamp": "1599206433",
      "altitude": "320"
    }
  ]
}
```

```

    },
    {
      "LNG":" 114.123456",
      "LAT":" -39.445566",
      "GEO_NS":" N",
      "GEO_EW":" E",
      "gpsNum":" 03",
      "hdop":" 1.49",
      "timestamp":" 1599206433",
      "altitude":" 320"
    }
  ],
  "timestamp":" 1599206433"
}

```

Parameter Description:

Parameter		Type	Length	Description
location	LNG	string	<12	Longitude "114.123456"
	LAT	string	<12	Latitude "-39.445566"
	GEO_N S	string	1	N or S
	GEO_E W	string	1	E or W
	gpsNum	integer		Number of satellites
	hdop	string	<8	Precision factor
	timestamp	string	10	"1599206433" timestamp
	altitude	string	<8	height
timestamp		string	10	"1599206433"

2.4.2. Global Configuration Parameter Reporting

Description:

The server will report the message after issuing the command to obtain global configuration parameters.

Message Topic:

- device -> server Topic name: om/client/data/global-config/{IMEI}

device > server data example:

```
{
  "heartbeatSet":
  {
    "interval": 0
  },
  "geofenceSet":
  {
    "enable":1,
    "unlockValid":1
  },
  "trackingSet":
  {
    "trackingEn": 1,
    "lockSDgap" :0,
    "unlockSDgap" :60,
    "backupSDgap" :240
  },
  "unlockReportSet":
  {
    "enable":1,
    "reportGap":1
  },
  "bleSet":
  {
    "key": "4BKNwi77",
    "name" : " scooter"
  },
  "audioSet":
  {
    "enable": 0,
    "norVol" :1,
    "mask": "1101010010"
  },
  "movementSet":
  {
    "enable": 1,
    "sensitivityLevel" :1,
  },
  "beaconSet":1,
  "periodPosgap":60,
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter		Type	Length	Description
heartbeatSet	interval	integer		Heartbeat interval; Unit S
trackingSet	trackingEn	integer		Whether to enable position tracking 0 - Disable 1 - Enable
	lockSDgap	integer		Time interval for sending positioning coordinates when vehicle is locked; Unit: S
	unlockSDgap	integer		Time interval for sending positioning coordinates when vehicle is unlocked; Unit: S
	backupSDgap	integer		Time interval for sending positioning coordinates when vehicle is powered by the battery; Unit: S

bleSet	key	string	8	Bluetooth key
	name	string	<=10	Bluetooth name
audioSet (reserved)	enable	integer		The working mode of playing voice function 1 - Enable the voice play only when the main battery supply is in use 0 - Disable the voice play
	norVol	integer		Ordinary volume; Default volume; Range: 1-3 1-Min; 3-max (default-3)
	mask	string	<=20	"1101010010" audio mask
unlockReport Set	enable	integer		Vehicle info report switch, Note: When set enabled, vehicle will report information(Scooter Information Reporting) 0 - Disabled (default) 1 - Enabled
	reportGap	integer		The unit of report interval: S; Max. value: 3600s; Default: 10s
movementSet	mode	integer		Whether to enable the movement alarm 0 - Disable 1 - Enable
	sensitivityLevel	integer		Sensitivity range 1-3
beaconSet		integer		Start beacon scan 1-Enable 0-Disable
geofenceSet	enable	integer		Geofence switch, Note: When geofence is disabled, geofence data will be forcibly cleared. When geofence file is in OTA, this function will be temporarily disabled. 0 - Disabled 1 - Enabled (default)
	unlockValid	integer		Determine if the geofence is enabled only when the device is unlocked. 0 - NO 1 - Yes (default)
periodPosgap		integer		Period report position gap, it will close gps module after periodPosgap. unit: 5-720 min Default 60 min.
timestamp		string	10	"1599206433"

2.4.3. Reporting of Vehicle-end Configuration Parameters

Description:

The server will report the message after issuing the command to obtain ECU configuration parameters.

Message Topic:

• device -> server Topic name: om/client/data/ecu-config/{IMEI}

device > server data example:

```
{
  "speedSet":
  {
    "speedMode": 1,
    "lowSpeed": 6,
    "midSpeed": 6,
    "highSpeed": 6,
    "speedUnit": 1,
    "cruiseControl": 0
  },
  "rfidEn": 1,
  "assistEnable": 1,
  "climbEn": 1,
  "lockMotor": 1,
  "startupMode": 1,
  "shiftGears": 1,
  "controlLed": 1,
  "timestamp": "1599206433"
}
```

Parameter Description:

Parameter		Type	Length	Description
speedSet	speedMode	integer		speedMode (FOR SCOOTER) 1 - ECO (lowSpeed) 2 - NORMAL(midSpeed) 3 - SPORT (highSpeed) speedMode (FOR EBIKE) 1 - Exercise 2 - ECO 3 - TURBO 4 -Electric
	lowSpeed	integer		Range of low-speed mode: 0-25km/h; Default: 6 km/h.
	midSpeed	integer		Range of middle-speed mode: 0-25km/h; Default: 10km/h.
	highSpeed	integer		Range of high-speed mode: 0-25km/h; Default: 15 km/h
	cruiseControl	integer		Cruise Mode 1-Enable 0 - Disable (default)
	speedUnit	integer		imperial units Mode 1-Enable 0 - Disable (default)
rfidEn		integer		Card reading enable 0-Do not enable 1-Enable
assistEnable		integer		Enable push assist 1 - Enable 0 - Disable

climbEn		integer		Enable climb assist 1-Enable 0 - Do not enable
lockMotor		integer		Lock Motor function (not allow motor rotate) 1-Enable 0 - Do not enable
startupMode		integer		0: do not set 1: non zero start 2: zero start
shiftGears		integer		shiftGears function by button 1-Enable 0 - Do not enable
controlLed		integer		controlLed function by button 1-Enable 0 - Do not enable
QRCode		string	<=16	Virtual QR code 16 hex characters
timestamp		string	10	"1599206433"

2.4.4. Vehicle Information Reporting

Description:

The server will actively report the message after issuing the command to obtain scooter information.

Message Topic:

• device -> server Topic name: om/client/data/scooter-info/{IMEI}

device > server data example:

```
{
  "ECU":
  {
    "vehicleType": "Ebike",
    "sysSoc":45,
    "speedMode":1,
    "speedKmh":30,
    "singleRideMile":" 545",
    "runTotalMile":" 54455",
    "remainingMileage":" 4545",
    "runTime":" 100",
    "charging":1,
    "vehicleState":1,
    "errorCode":30,
    "lockState":" 1011",
    "QRCode":" 25652587547ADADF"
    "avspeedKmh":10,(reserved)
    "maxspeedKmh": 25,(reserved)
    "power_use":" 100",(reserved)
  },
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter		Type	Length	Description
	vehicleType	integer		Name of the category of the vehicle, such as Scooter, Ebike, HorseLock
	sysSoc	integer		Percentage of system voltage

ECU	speedMode	integer		Speed mode 1 2 3: low, medium and high
	speedKmh	integer		Current speed KM/H
	singleRideMile	string	<10	Total mileage m
	runTotalMile	string	<10	Total mileage m
	remainingMileage	string	<10	Total remaining mileage (10m)
	runTime	string	<10	Driving time; Unit: S
	charging	integer		charging status 0-Not charging 1- Charging
	vehicleState	integer		vehicle status 0- Locked 1-Unlocked
	lockState	string	4	Lock status, three-digit character "0101". The first digit indicates the steel cable lock status, the second digit indicates the battery lock status, the third digit indicates the helmet lock status, and the fourth digit indicates the Hub lock status. 0-Locked 1-Unlocked
	errorCode	integer		Error code
	QRCode	string	<=32	Virtual QR code 32 hex characters
	avspeedKmh	integer		average speed KM/H
	maxspeedKmh	integer		MAX SPEED KM/H
	power_use	integer		POWER USE
timestamp		string	10	"1599206433"

2.4.5. VER_SN Information Reporting

Description:

The server will actively report the message after issuing the command to obtain version SN information.

Message Topic:

• device -> server Topic name: om/client/data/versn-info/{IMEI}

device -> server data example:

```
{
  "vehicleType": "Ebike",
  "protVersion": "1.1.4",
  "HardwareType": "M113",
  "Firmware":
  {
    "IoT": "110",
    "audioMcu": "110",
    "iotBle": "246",
    "ECU": "110",
    "DIS": "110",
    "BMS": "110",
    "batLock": "110",
    "cableLock": "110",
    "helmetLock": "110",
```

```

"hubLock": "110"

},
"timestamp": "1599206433"

}

```

Parameter Description:

Parameter	Attribute	Type	Length	Description
vehicleType		integer		Name of the category of the vehicle, such as Scooter, Ebike, HorseLock
protVersion		string	4-20	Protocol version number. When registering a device, the server uses this number to check whether the protocol version of the device is matched. If the version is not matched, an error ID will be returned.
HardwareType		string	4-20	The product hardware type example:M113/M128 ..
Firmware	IoT	string	<=4	IOT firmware version
	audioMcu	string	<=4	Audio chip firmware version
	iotBle	string	<=4	Ble ble firmware version
	ECU	string	<=4	ECU firmware version
	DIS	string	<=4	Display firmware version
	BMS	string	<=4	Battery firmware version
	batLock	string	<=4	Battery lock firmware version
	cableLock	string	<=4	cableLock firmware version
	helmetLock	string	<=4	helmetLock firmware version
	hubLock	string	<=4	hubLock firmware version
timestamp		string	10	"1599206433"

2.4.6. Failure Information Reporting

Description:

The server will actively report the message after issuing the command to obtain error information of the vehicle.

Message Topic:

• device -> server Topic name: om/client/data/error-info/{IMEI}

device -> server data example:

```

{
  "ecuError": 11,
  "batlockError": 11,

```

```

    "cablelockError": 11,
    "helmetlockError": 11,
    "hublockError": 11,
    "IoTErrors": "11",
    "timestamp": "1599206433"
}

```

Parameter Description:

Parameter	Attribute	Type	Length	Description
ecuError		integer		ECU failure code
batlockError		integer		Battery lock failure code
cablelockError		integer		Cable lock failure code
helmetlockError		integer		helmetlock failure code
hublockError		integer		hublock failure code
IoTErrors		integer		IoT failure code
timestamp		string	10	"1599206433"

2.4.7. BMS Information Reporting

Description:

The server will actively report the message after issuing the command to obtain BSM information. (reserved)

Message Topic:

• device -> server Topic name: om/client/data/bms-info/{IMEI}

device -> server data example:

```

{
    "bmsState":1,
    "current":10,
    "cycles":100,
    "temperature":60 ,
    "voltage":36,
    "totalCapacity":100,
    "currentCapacity":100,

```

```
"bmsError":11,  
"timestamp":" 1599206433"  
}
```

Parameter Description:

Parameter	Type	Length	Description
bmsState	integer		Battery connection status 1- Connected 0- Removed
version	string	<5	Battery firmware version
SN	string	14	Serial number of the vehicle battery
health	integer		Battery health state 0-100
current	string	<6	Electric current, in mA
cycles	integer		Battery cycles
temperature	integer		Battery temperature, in °C
voltage	integer		Battery voltage, in mV
totalCapacity	integer		Total battery capacity, in mAh
currentCapacity	integer		Current capacity, in mAh
bmsError	integer		Error code
timestamp	string	10	timestamp

2.4.8. Alarm Information Reporting

Description:

The device will trigger an alarm report when it detects illegal movements, falls, illegal removal of parts, and abnormal power supply.

Message Topic:

• device -> server Topic name: om/client/data/alarm-info/{IMEI}

device -> server data example:

```
{  
  "alarmFlag":1 ,  
  "alarmType":1 ,  
  "location":  
    {  
      "LNG":" 114.123456",  
      "LAT":" -39.445566",  
      "GEO_NS":" N",  
      "GEO_EW":" E",  
      "gpsNum":" 03",  
      "hdop":" 1.49",  
      "timestamp":" 1599206433",  
      "altitude":" 320"  
    },  
}
```

```

}
"timestamp": "1599206433"

```

Parameter Description:

Parameter		Type	Length	Description
alarmFlag		integer		Alarm mark 1-Alarm occurred 0-Alarm removed
alarmType		integer		Alarm type 1-Illegal movement （only support alarm removed） 2-Fall 3-Illegal removal of IoT 4-Abnorma/low power supply 5-Illegal removal of battery
location	gpsFlag	integer	1	Positioning status 0-satellite navigation 1-Satellite + inertial navigation 2-inertial navigation only 3-Beacon positioning
	LNG	string	<12	Longitude "114.123456"
	LAT	string	<12	Latitude "-39.445566"
	GEO_N S	string	1	N or S
	GEO_E W	string	1	E or W
	gpsNum	integer		Number of satellites
	hdop	string	<8	Precision factor
	timestamp p	string	10	"1599206433" timestamp
	altitude	string	<8	height
timestamp		string	10	"1599206433"

2.4.9. Lock Operation Information Reporting

Description:

The device will actively report the result of lock operation after the server issues the command of lock operation.

Message Topic:

• device -> server Topic name: om/client/data/lock-event/{IMEI}

device -> server data example:

```
{
  "operateType":1 ,
  "lockType":1 ,
  "operateResult":1 ,
  "errorCode":1 ,
  "location":
    {
      "LNG":" 114.123456",
      "LAT":" -39.445566",
      "GEO_NS":" N",
      "GEO_EW":" E",
      "gpsNum":" 03",
      "hdop":" 1.49",
      "timestamp":" 1599206433",
      "altitude":" 320"
    },
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter		Type	Length	Description
operateType		integer		1-Unlock 0-Lock
lockType		integer		1-Vehicle lock 2-Cable lock 3-Battery lock 4-Mechanical lock (reserved)
operateResult		integer		Operation results 1- Succeeded 0-Failed
location	gpsFlag	integer	1	Positioning status 0-satellite navigation 1-Satellite + inertial navigation 2-inertial navigation only 3-Beacon positioning
	LNG	string	<12	Longitude "114.123456"
	LAT	string	<12	Latitude "-39.445566"
	GEO_NS	string	1	N or S
	GEO_EW	string	1	E or W
	gpsNum	integer		Number of satellites
	hdop	string	<8	Precision factor
	timestamp	string	10	"1599206433" timestamp

	altitude	string	<8	height
errorCode		integer		Lock operation failure cause 1-Failure in communication with the controller 2-Improper lock position. If there is no error, return a 0.
timestamp		string	10	"1599206433"

2.4.10. RFID Card Operation Reporting

Description:

The device will actively report the card number reading result when someone swipes a card .(reserved)

Message Topic:

• device -> server Topic name: om/client/data/rfid-event/{IMEI}

device -> server data example:

```
{
  "rfidInfo":" 11435455446" ,
  "cardType":1 ,
  "reqType":1 ,
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter		Type	Length	Description
rfidInfo		string	32	Card information when someone swipes a card.maximum 32 bytes
cardType		integer	1	Card type 0->TYPE A 1->TYPE B
reqType		integer	1	Request type 0->request unlock 1->request lock
timestamp		string	10	"1599206433"

2.4.11. SIM Card Information Report

Description:

Report current status of the SIM card. The device will return the current status of SIM card after receiving the request from the server to query the SIM card status.

Message Topic:

- device -> server Topic name: om/client/data/simcard-info/{IMEI}

server -> device data example:

```
{
  "simcard":
  {
    "ICCID": "89860468152080348393",
    "APN": "CMNET"
  },
  "timestamp": "1599206433"
}
```

Parameter Description:

Parameter	subparameter	Type	Length	Description
simcard	ICCID	string	20	Traditional simcard ICCID
	APN	string	<10	APN
timestamp		string	10	"1599206433"

2.4.12. Reporting Entering and Exiting Geofences Events

Description:

When there are events of entering or exiting geofences, the device will actively report the events and the results of location data.
(only for the iot which have geofence feature)

Message Topic:

- device -> server Topic name: 9b/client/data/geofence-info/{IMEI}

device -> server data example:

```
{
  "geofence": {
    "eventType":1,
    "quantity":2 ,
    "data":
    [
      {
        "id":1 ,
        "LNG":" 114.123456",
        "LAT":" -39.445566"
      },
      {
        "id":2 ,
        "type":" Opr",
        "LNG":" 114.123456",
        "LAT":" -39.445566"
      }
    ]
  },
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter	subparameter	Type	Length	Description
eventType		integer		Geofence event type 0: Entering the geofence 1: Exiting the geofence 2: Not in any geofences (report for one time when being out of all geofences, or not found in any geofences in the first judgement after being enabled (and valid location is acquired))
quantity		integer		Number of geofence where current device is located <10
data	id	integer		Geofence ID, single Geofence ID. If multiple geofences are detected in one time, report all the geofences. When the event type is 2, leave the value blank.
	LNG	string	<12	Longitude "114.123456"
	LAT	string	<12	Latitude "-39.445566"

2.4.13. Network Update Event Information Reporting

Description:

The device will actively report network update event when the network parameters are updated (for example, the update of APN and base station connection).

Message Topic:

- device -> server Topic name: om/client/data/network-event/{IMEI}

device -> server data example:

```
{
```

```

"networkinfo":
{
  "serverAddr": "202.104.62.38",
  "serverPort": "1883",
  "apnName": "CMNET",
  "apnUserName": "",
  "apnPassword": "",
  "MCC": "111",
  "MNC": "121",
  "LAC": "11FF",
  "CELLID": "10107734",
  "Revision": "A011B13A7670M6",
  "currentIccid": "89860468152080348701",
},
"timestamp": "1599206433"
}

```

Parameter Description:

Parameter		Type	Length	Description
apnUpdate	serverAddr	string	<64	Server address, domain name or IP address
	serverPort	string	<6	Port number 0-65535
	apnName	string	<10	APN
	apnMode	string	1	Verify APN user name and password mark. 0 Do not verify; 1 Verify
	apnUserName	string	<10	APN user
	apnPassword	string	<10	APN password
	MCC	string	< 4	Mobile Country Code
	MNC	string	< 4	Mobile Network Code
	LAC	string	<= 4	"11FF" position code two byte hexadecimal number
	CELLID	string	<= 8	"10107734" CELL id, in decimal digit characters
	currentIccid	string	20	Current ICCID
	Revision	string		4G MODEL version
timestamp		string	10	"1599206433"

2.4.14. User Behavior Information Reporting

Description:

IoT will report every operation event of the user when the user interacts with the scooter.

Message Topic:

• device -> server Topic name: om/client/data/user-behavior/{IMEI}

device -> server data example:

```
{
  "behaviorType":1,
  "subType":10,
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter	Type	Length	Description
behaviorType	integer		1: Turn on/off the light 2: Charge the battery 3: Install/remove the battery 4: operate charge cable 5:TURN ON/OFF DISPLAY 6:RIDE START/END (customized reserved)
subType	integer		1 Turn on/off the light
			10 The first number: 1-Headlight 2-Tail light (reserved) 3-Left turn signal (reserved) 4-Right turn signal. (reserved) The second number: 0-Turn off the light; 1-Turn on the light.
			2 Charge the battery
			1:Charge the battery
			3 Install/remove the battery
			1: The user removes the battery 0: The user installs the battery
			4 Charge the battery
			1: Insert the charge cable 0: Take out the charge cable out
			5:TURN ON/OFF DISPLAY(customized reserved)
			1:Turn on display 0:turn off display
			6:RIDE START/END
			1:RIDE START 2:RIDE END
timestamp	string		10

2.4.15. Rfid Data Information Reporting

Description:

The device reports all the rfid datas. It can list up 10 cardnumber data..**(reserved)**

Message Topic:

- device -> server Topic name: om/client/data/rfid-info/{IMEI}

device > server data example:

```
{
  rfidNum:2,
  "rfidInfo":
  [
    {
      "card": " 3399206433221122" ,
    },
    {
      "card": " 3399206433221111" ,
    },
    {
      "card": " 3399206433221133" ,
    },
  ],
  "timestamp":" 1599206433"
}
```

Parameter Description:

Parameter		Type	Length	Description
rfidNum		integer		The rfid quantity in the lock.
rfidInfo	card	string	32	RFID card number
timestamp		string	10	"1599206433"

2.4.16. Beacon scan Reporting

Description:

IoT will report beacon information when it scan beacon. Maximum support 8 beacon (**reserved**)

Message Topic:

• device -> server Topic name: om/client/data/beacon-info/{IMEI}

Note: This command is only applicable to the horse lock that supports the Beacon function. The Beacon verification function is used to return the car at the designated location. The Omi Beacon device needs to be placed at the return point. After the horseshoe lock is locked, it will continue to search for the Beacon device for 5 seconds and upload the search. As a result, the server determines whether to settle the fee according to the uploading result.

device -> server data example:

```
{
  "getBeacon":2,
  "beaconInfo":
  [
    {
      "MAC": "8C:59:DC:F1:18:0B",
      "Rssi": -80,
      "beaconVpc": 80
    },
    {
      "MAC": "A4:C1:38:26:F6:E3",
      "Rssi": -57,
      "beaconVpc": 91
    }
  ],
  "location":
  {
    "LNG": "114.123456",
    "LAT": "-39.445566",
    "GEO_NS": "N",
    "GEO_EW": "E",
    "gpsNum": "03",
    "hdop": "1.49",
    "timestamp": "1599206433",
    "altitude": "320"
  },
  "timestamp": "1599206433"
}
```

Parameter Description:

Parameter	Type	Length	Description
getBeacon	integer		scan the beacon device or not 1:find beacon quantity 0:no beacon find.

beaconInfo	MAC	string	Beacon device mac address
	Rssi	string	RSSI VALUE
	beaconVpc	integer	Voltage percent 0-100
timestamp	string		timestamp

2.5. Upgrade

2.5.1. Active Upgrade of Server

Description:

The server actively sends upgrade command. The device responds and reports upgrade status.

Message Topic:

- server -> device Topic name: om/server/req/ota-upgrade/{IMEI}
- device -> server Topic name: om/client/res/ota-upgrade/{IMEI}

server -> device data example:

```
{
  "operationId": 1860,
  "operateType": 1,
  "otaPara":
  {
    "updateType": 1 ,
    "subType": 1,
    "timeout": 10,
    "URL": " http://local.test.network:7070/file/GEN4_V3_86_V1.0.0.2.bin",
    "checksum": 10
  },
  "timestamp": " 1599206433"
}
```

device -> server data example:

```
{
  "code": 200,
  "timestamp": "1599206433",
  "operationId": 1860
}
```

Parameter Description:

Parameter		Type	Length	Description													
operationId		integer		The random operation number generated by the server. Range: 0-65535													
operateType		integer		Operate type 0-stop update 1-start update													
otaPara	updateType	integer		Upgrade type: 0-IoT firmware 1-Vehicle firmware 2-Bluetooth 3-Voice pack 4-Geofence file 5-GPS firmware													
	subType	integer		Upgrade subtypes When updateType is 1-Vehicle firmware , the subtypes include the following: 1-ECU firmware 2-BMS1 firmware (Main battery) 3-BMS2 firmware (Reserved) 4-Meter firmware. 5-Battery lock firmware.(Only E-bike) 6-Repeater/Cable-Lock firmware.(Only E-bike) 7-Encryption chip firmware(Only E-bike) 8-ChargePort Version(Only E-bike) 10-dashboard When updateType is 3-Voice pack , for scooter: the subtype is 999-Upgrade the entire audio file of the audio IC (default) for Ebike,: it should be the specific audio file: <table><tr><th>Value</th><th>Type</th></tr><tr><td>0</td><td>ECU Locked</td></tr><tr><td>1</td><td>ECU Unlocked</td></tr><tr><td>2</td><td>Main power on/charging/Mode switching/NFC card reading successful/Battery-cover unlocked/Battery-cover locked/Cable lock unlocked/Cable lock locked/Fully charged/Euler angle calibration</td></tr><tr><td>3</td><td>Illegal moving alarm</td></tr><tr><td>4</td><td>Fault alarm</td></tr><tr><td>5</td><td>Alarm (Overturn/Fall)</td></tr></table>	Value	Type	0	ECU Locked	1	ECU Unlocked	2	Main power on/charging/Mode switching/NFC card reading successful/Battery-cover unlocked/Battery-cover locked/Cable lock unlocked/Cable lock locked/Fully charged/Euler angle calibration	3	Illegal moving alarm	4	Fault alarm	5
Value	Type																
0	ECU Locked																
1	ECU Unlocked																
2	Main power on/charging/Mode switching/NFC card reading successful/Battery-cover unlocked/Battery-cover locked/Cable lock unlocked/Cable lock locked/Fully charged/Euler angle calibration																
3	Illegal moving alarm																
4	Fault alarm																
5	Alarm (Overturn/Fall)																

				6	Locating
	timeout	integer		Download timeout period (10-180min)	
	URL	string	<300	Download address URL (<300 BYTES)	
	checksum	integer		The total file check codes. Take checksum as the algorithm, accumulate all the bytes of the file, take the data of 4 bytes in the lower place, and finally transform them into a decimal integer expressed by a character string.	
code		integer		200 The device starts to prepare for the upgrade.	
timestamp		string	10	"1599206433"	

2.5.2. Upgrade Status Reporting

Description:

After receiving update instructions, the device will report the current information of update status.

Message Topic:

- device -> server Topic name: om/client/data/ota-info/{IMEI}

device -> server data example:

```
{
  "updateType": 1,
  "subType": 1,
  "otaState": "202",
  "breakpointTransfer": 0,
  "startRange": 0,
  "timestamp": "1599206433"
}
```

Parameter Description:

Parameter	Type	Length	Description
updateType	integer		Upgrade type: 0-IoT firmware 1-Vehicle firmware 2-Bluetooth 3-Voice pack 4-Geofence file 5-GPS firmware
subType	integer		Upgrade subtype When updateType is 1-Vehicle firmware, the subtypes include the following: 1-ECU firmware 2-BMS1 firmware (built-in) 3-BMS2 firmware (external) 10-dashboard ·When updateType is 3-Voice pack, the subtype includes the following: 999-Update the entire audio file of the audio IC (default)
otaState	string	3	Upgrade status: 100: IoT confirms that it has received the update request 101: Update request was refused by IoT 102: Server closes the update process 103: Update was refused because of low battery (battery capacity is higher than 5%) 200: IoT starts to download the pack 201: IoT successfully downloaded the pack 202: IoT failed to download the pack 300: The device starts to update the firmware 301: The device successfully updated the firmware 302: The device failed to update the firmware 303: Firmware update failed to start because of low battery 304: Firmware update failed to start because of version incompatibility 305: Certificate successfully updated 306: Certificate failed to download
breakpointTransfer	integer		When the upgradestatus is 200: number of times of resuming from breaks (number of times of resuming after the downloaded pack is interrupted): the default number is 0, 0~255
startRange	integer		When the upgrade status is 200: the number of starting byte of Range of the downloaded pack: the default value is null, 0~4294967295
timestamp	string	10	"1599206433"

3. Appendix I: Error Codes

Code	Description
200	Succeeded
201	Failed
202	Timeout

4. BLE communication protocol description

4.1 Instruction format

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	Data length (length of DATA)
3	RAND	Random number, generated by the data sender, used to encrypt
4	KEY_once	The communication key is randomly generated by the lock
5	CMD	Command word
6	DATA	data
6+LEN	CRC	Encrypted CRC8 check value before CRC

Note: greater than 2Byte data high byte before

4.2 Data encryption process

Encrypted composition: randomnumber, KEY。 Encryption process:

- 1、Generate random number RAND
- 2、Generate random number variants $RAND_1 = RAND + 0x32$
- 3、Fill RAND_1 into the third byte of the data.
- 4、After using RAND to XOR (^) RAND, the plaintext data before the CRC and the result corresponding backfill
- 5、Perform CRC8 check on the data before CRC, and fill in the check value to the CRC position. **Bluetooth encryption, decryption reference Appendix I.**

4.3 APP and IoT communication process

APP establishes Bluetooth connection with IoT

1. APP sends a (0x01) command to the IoT to obtain the communication key KEY
2. The IoT returns the communication key KEY, and the APP needs to save the secret key for subsequent communication.
3. APP communicates with the IoT

Note: The key KEY is re-acquired only when the APP establishes a Bluetooth connection with the IoT, and the communication remains unchanged after that.

4.4 UUID used by the lock

Service UUID : 6e400001-b5a3-f393-e0a9-e50e24dcca9e Characteristic under the service

Characteristic UUID	Operation type	Description
6e400002-b5a3-f393-e0a9-e50e24dcca9e	Write	Write commands to the hardware
6e400003-b5a3-f393-e0a9-e50e24dcca9e	Notify	Information returned by the hardware

Note: When you register for notifications, you need to use the UUID of the character under the character: 00002902-0000-1000-8000-00805f9b34fb , IOS does not need to.

4.5 Lock command details and examples

4.5.1 Verify device KEY to get communication KEY command (0x01)

APP->lock

When the App is connected to the Bluetooth device, the device KEY is first verified by the 0x01 command to obtain the KEY for communication with the Bluetooth device. The device KEY of each IoT is different, and the user can also define the device KEY by himself. When the connected Bluetooth device does not send the 0x01 command within 5 seconds, or the authentication pairing password is incorrect, the Bluetooth device will automatically disconnect from the app.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x08
3	RAND	random number
4	KEY	0x00
5	CMD	0x01
6-13	DATA	Device KEY, 8 bytes (yOTmK50z)
14	CRC	Encrypted CRC8 check value before CRC

lock->APP

After receiving the communication KEY command, the IoT returns the KEY for communication in DATA. This obtained communication KEY is valid for this connection.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x02
3	RAND	random number 0x00
4	KEY	Communication key 0x00 Populate the current KEY
5	CMD	0x01
6	DATA	Verification ID: (1: Success, 0: Failure)
7	DATA	Communicationkey(KEY)forcurrentcommunicationKEY
8	CRC	Encrypted CRC8 check value before CRC

4.5.2 Instruction error prompt instruction (0x10)

IoT->APP

After the user connects to the device, if the KEY of the communication is not obtained through the 0x01 command, the user directly sends an instruction such as 0x12, 0x13 to communicate with the device. Then the device prompts the user with the instruction. The user has acquired the communication KEY, but when sending other instructions, the communication KEY used is incorrect, and the instruction is also prompted.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key 0x00 or current KEY
5	CMD	0x10
6	DATA	Error message: 1: CRC authentication error 2: The communication KEY was not obtained 3: The communication KEY has been obtained, but the communication KEY is wrong 4: device is shutdown
7	CRC	CRC8 check value after data encryption before CRC

4.5.3 Unlock command (0x05)

APP->lock

Byte	Item	description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x0A
3	RAND	random number
4	KEY	Communication key
5	CMD	0x05
6	DATA	0x01 (Control instruction)
7-10	DATA	User ID
11-14	DATA	Operation timestamp
15	DATA	Status 0-> Normal unlock 0xA0-> Do not reset riding time when unlock
16	CRC	CRC8 check value after data encryption before CRC

lock-> APP

Byte	Item	description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x05
3	RAND	random number
4	KEY	Communication key
5	CMD	0x05
6	DATA	Control result (1: Success 2: Fail / Timeout)
7-10	DATA	Operation timestamp
11	CRC	Encrypted CRC8 check value before CRC

APP->lock

After the APP receives the operation status command issued by the lock (1: success, 2: failure/timeout), the vehicle locks the lock. If it does not reply, the lock is uploaded through the network (L0 command).

Byte	Item	description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x05
6	DATA	0x02 (Reply instruction)
7	CRC	Encrypted CRC8 check value before CRC

4.5.4 Lock command (0x15)

APP->lock

Byte	Item	description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x15
6	DATA	0x01 (Control instruction)
7	CRC	CRC The encrypted data of the previous CRC8 check value

lock->APP

Byte	Item	description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x09
3	RAND	random number
4	KEY	Communication key
5	CMD	0x15
6	DATA	Control result (1: Success 2: Fail / Timeout)
7-10	DATA	Unlock timestamp [unlock sequence]
11-14	DATA	Unlocking time
15	CRC	Encrypted CRC8 check value before CRC

APP->lock

After the APP receives the parking state command issued by the IoT (1: the operation is successful, 2 the operation timeout), the IoT is restored, and if it does not reply, the IoT uploads the operation state through the network (L1 command).

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x15
6	DATA	0x01 (Reply instruction)
7	CRC	Encrypted CRC8 check value before CRC

4.5.5 Query lock information (0x31)

APP->lock

You can get information about the lock switch status, battery level, and old data.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x31
6	DATA	0x01 (Control instruction)
7	CRC	Encrypted CRC8 check value (0-5) before CRC

lock->APP

After the device receives the query status, it will return the current switch status, battery power, and old

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x07
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x31
6	DATA	Battery voltage (mV) H
7		Battery voltage (mV) L
8		Device status 1
9		0(Reserved)
10	DATA	Major version number
11	DATA	Minor version number
12	DATA	Version revisions
13	CRC	Encrypted CRC8 check value before CRC

data in DATA.。

Device status 1[0-7] BIT bit identification details.

BTT bit	Bit details	Value status	Value status (0)
0	unlock	Unlocked state	invalid
1	Lock	Locked state	invalid
2	No content	---	--
3	No content	--	--
4	No content	--	--
5	No content	--	--
6	Old usage	Unlocked state	invalid

7	No content	Locked state	invalid
---	------------	--------------	---------

4.5.6 Change ble key information (0x32)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x08
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x32
6	DATA	Ble key first byte example key C3g185Gp HEX is: 43 33 67 31 38 35 47 70 so first byte is 0x43
7	DATA	Ble key byte 2
8	DATA	Ble key byte 3
9	DATA	Ble key byte 4
10	DATA	Ble key byte 5
11	DATA	Ble key byte 6
12	DATA	Ble key byte 7
13	DATA	Ble key byte 8
12	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x09
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x32
6	DATA	return: 0: Success 1: Fail
7	DATA	Return Ble key first byte example key C3g185Gp HEX is: 43 33 67 31 38 35 47 70 so first byte is 0x43
8	DATA	Ble key byte 2
9	DATA	Ble key byte 3
10	DATA	Ble key byte 4
11	DATA	Ble key byte 5
12	DATA	Ble key byte 6
13	DATA	Ble key byte 7
14	DATA	Ble key byte 8
15	CRC	Encrypted CRC8 check value before CRC

4.5.7 Change ble name (0x33)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x06 maximum
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x33
6	DATA	Ble name first byte example key "OMIIOT" HEX is: 4F 4D 49 49 4F 54 so first byte is: 0x4F (NOTE Maximum six byte for user.)
7	DATA	Ble key byte 2
8	DATA	Ble key byte 3
9	DATA	Ble key byte 4
10	DATA	Ble key byte 5
11	DATA	Ble key byte 6
12	CRC	Encrypted CRC8 check value before CRC

lock->APP

字节	项	说明
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x07 maximum
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x33
6	DATA	return: 0: Success 1: Fail
7	DATA	Return Ble name first byte example key "OMIIOT" HEX is:4F 4D 49 49 4F 54 so first byte is: 0x4F (NOTE Maximum six byte for user.)
8	DATA	Ble key byte 2
9	DATA	Ble key byte 3
10	DATA	Ble key byte 4
11	DATA	Ble key byte 5
12	DATA	Ble key byte 6
13	CRC	Encrypted CRC8 check value before CRC

4.5.8 Change MQTT login username (0x34)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	Maximum 23 bytes
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x34
6-21	DATA	MQTT server log username,maximum 23 bytes.
22	CRC	Encrypted CRC8 check value before CRC

lock->APP

字节	项	说明
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	Maximum 24 bytes
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x34
6	DATA	return: 0: Success 1: Fail
7	CRC	Encrypted CRC8 check value before CRC

4.5.9 Change MQTT login password (0x35)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	Maximum 32 bytes
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x35
6-39	DATA	MQTT server login password,maximum 32 bytes.
40	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	Maximum 32 bytes
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x35
6	DATA	return: 0: Success 1: Fail
7	CRC	Encrypted CRC8 check value before CRC

4.5.10 Change Movement setting (0x36)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	Maximum 32 bytes
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x36
6	DATA	Movement enable : 1:enable 0:disable
7	DATA	Sensitivity: 1:low 2:medium 3:high
8	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x36
6	DATA	return: 0: Success 1: Fail
7	CRC	Encrypted CRC8 check value before CRC

4.5.11 regist rfid card (0x85)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x85
6	DATA	Default 0x01
15	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x09
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x85
6	DATA	0:start read card 1:read card success,card valid 2:add card fail 3:card is exist
7-10		High four byte of the card
11-14		Low four byte of the card
15	CRC	Encrypted CRC8 check value before CRC

4.5.12 delete card (0x86)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	08
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x86
6-9	DATA	High four byte of the card
10-13	DATA	Low four byte of the card NOTE:When byte6-byte13 both 0x00, it means delete all the card in lock.
15	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x86
6	DATA	0:delete fail/ card not exist 1:delete successful
7	CRC	Encrypted CRC8 check value before CRC

4.5.12 query card (0x87)**APP->lock**

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x87
6	DATA	Index of card (0 -- 4) ,return the card number.
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x0C
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x87
6-9	DATA	High four byte of the card
10-13	DATA	Low four byte of the card
46	CRC	Encrypted CRC8 check value before CRC

4.5.13 Ebike setting (0x39)**APP->lock**

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x39

6	DATA	Cruise Control 0xff: no set	0x01 :enable	0x00: disable
7	DATA	Assist Enable 0xff: no set	0x01 :enable	0x00: disable
8	DATA	climb Enable 0xff: no set	0x01 :enable	0x00: disable
9	DATA	Throttle Control 0xff: no set	0x01 :enable	0x00: disable
10	DATA	IOT reset to factory setting. 0x01	0xff: no set	
11	CRC	Encrypted CRC8 check value before CRC		

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x39
6	DATA	return: 0: Success 1: Fail
7	CRC	Encrypted CRC8 check value before CRC

4.5.13 move car mode(0x40)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x40
6	DATA	0x01 :enable 0x00: disable
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x40
6	DATA	return: 0: Success 1: Fail
7	CRC	Encrypted CRC8 check value before CRC

4.5.14 Get the last usage data (0x51)

Note: This data is the return data of the lock that has passed the BLE or failed to upload via TCP after receiving the lock command, including the user ID and the time of the vehicle, for the settlement fee.

APP->lock

When the App obtains the lock information, if it finds that the old data is used, the old data can be obtained and uploaded to the server.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x51
6	DATA	0x01 (Control instruction)
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

Used data, that is, data that was not uploaded to the server after the last lockout, including timestamp, duration, user ID.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x0C
2	RAND	Random number
3	KEY	Communication key
4	CMD	0x51
5-8	DATA	Unlock timestamp
9-12	DATA	usage time Unit: second
13-16	DATA	User ID
17	CRC	Encrypted CRC8 check value before CRC

4.5.15 Clear usage data in the lock (0x52)

APP->lock

After the app uploads the used data to the server, it can erase the used data stored in the device.

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x52
6	DATA	0x01 (Control instruction)
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	According to the header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x52
5	DATA	Return value: 0: Success 1: Failure
6	CRC	Encrypted CRC8 check value before CRC

4.5.16 Get scooter information (0x60)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x60
6	DATA	0x01 (Control instruction)
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x08
3	RAND	random number
4	KEY	Communication key
5	CMD	0x60
6	DATA	The current power of the scooter is 80->80%
7		Current mode of scooter 1: low speed 2: medium speed 3: High speed
8-9		Current speed 221->22.1km/h
10-11		Single riding mileage, Unit 10m
12-13		Estimated remaining mileage, unit 10m
14	CRC	Encrypted CRC8 check value before CRC

4.5.17 Set scooter (0x61)

APP->lock

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x04
3	RAND	random number
4	KEY	Communication key
5	CMD	0x61
6	DATA	Headlight switch 0: Invalid (not set) 1: Off 2: On
7		Mode setting 0: Invalid (not set) 1: Low speed 2: Medium 3: High
8		Throttle response 0: Invalid (not set) 1: Off 2: On
9		Taillight flashing 0: Invalid (not set) 1: Off 2: On
10	CRC	Encrypted CRC8 check value before CRC

Lock->APP

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x61
6	DATA	Return value: 0: Success 1: failure
7	CRC	Encrypted CRC8 check value before CRC

4.5.18 Scooter setting 2 (0x62)

Note: The following setting information can be set to save the original value after power off APP-> IOT

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x06
3	RAND	random number
4	KEY	Communication key
5	CMD	0x62
6	DATA	0: The following settings are not saved, and the original settings are restored after the switch is locked 1: Save the following settings, and maintain the settings after power off
7		Fixed speed cruise setting 0: invalid (not set) 1: off 2: on
8		Start mode setting 0: invalid (not set) 1: non-zero start 2: zero start
9		Low speed mode speed limit value 0: invalid (not set) Range: 6-25km / h
10		Medium speed mode speed limit value 0: invalid (not set) Range: 6-25km / h
11		High speed mode speed limit value 0: invalid (not set) Range: 6-25km / h
12	CRC	CRC8 check value after data encryption before CRC

IOT->APP

byte	item	Description
0-1	STX	Data header / frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x62
6	DATA	Return value: 0: success 1: failure
7	CRC	CRC8 check value after data encryption before CRC

4.5.19 Unlock external devices (0x81)

APP->lock

byte	item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x81
6	DATA	Operation 0x01-> Battery lock unlock 0x02-> helmet lock unlock 0x03-> Cable lock unlock 0x11-> Battery lock lock 0x12-> helmet lock lock 0x13-> Cable lock lock 0x21-> Get battery lock status 0x22-> Get helmet lock status 0x23-> Get
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

byte	Item	Description
0-1	STX	Encrypted CRC8 check value before CRC
2	LEN	0x02
3	RAND	random number
4	KEY	Communication key
5	CMD	0x81
6	DATA	Operation 0x01-> Battery lock unlock 0x02-> helmet lock unlock 0x03-> Cable lock unlock 0x11-> Battery lock lock 0x12-> helmet lock lock 0x13-> Cable lock lock 0x21-> Get battery lock status 0x22-> Get helmet lock status 0x23-> Get cable lock status
7		Operation result 0x00-> success 0x01-> failure 0x02-> communication timeout with the device
8	CRC	Encrypted CRC8 check value before CRC

4.5.20 Transportation mode (0x91)

APP->lock

byte	item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	random number
4	KEY	Communication key
5	CMD	0x91
6	DATA	Operation 0x01-> Enter Transportation mode 0x02-> Exit Transportation mode
7	CRC	Encrypted CRC8 check value before CRC

lock->APP

byte	Item	Description
0-1	STX	Encrypted CRC8 check value before CRC
2	LEN	0x1
3	RAND	random number
4	KEY	Communication key
5	CMD	0x91
6	DATA	Operation result 0x00-> success 0x01-> failure
7	CRC	Encrypted CRC8 check value before CRC

4.5.21 APP requests to obtain the car lock information(0xFA)**APP->lock**

byte	Item	Description
0-1	STX	Data header/frame header Fixed value:0xA3A4
2	LEN	0x00
3	RAND	Random number
4	KEY	Communication key
5	CMD	0xFA
6	CRC	Encrypted CRC8 check value before CRC

lock->APP

No response, the lock receives the 0xFA command and sends the 0xFB command to start data transmission

4.5.22 Start the data transfer command(0xFB)**APP->lock**

byte	Item	Description
0-1	STX	Data header/frame header Fixed value:0xA3A4
2	LEN	0x0A
3	RAND	Random number
4	KEY	Communication key
5	CMD	0xFB
6	TYPE	Transfer data type(0:Upgrade file 1:System information)
7-8	N_PACK	Total number of the packets(2 bytes, subcontracted by 128 Bytes, high byte first)
9-10	DATA_CRC	Total CRC16 check value of the upgrade data(2 bytes including the last packet of zeros, high byte first)
11	DIV_TYPE	Corresponding device type (1byte) (for mqtt protocol,use 0X86)
12-15	VIF_KEY/total len	Verification key (4byte) (upgrade file size) for example: 76640 ,hex format is 0x12B60 .fill in 0x00 0x01 0x2b 0x60
16	CRC	Encrypted CRC8 check value before CRC

4.5.23 Fetch data command(0xFC)

APP->lock

byte	Item	Description
0-1	STX	Data header/frame header Fixed value:0xA3A4
2	LEN	0x03
3	RAND	Random number
4	KEY	Communication key
5	CMD	0xFC
6-7	N_PACK	The number of packets of data to be fetched (2 bytes, starting with 0, high byte first)
8	D_TYPE	Device type
9	CRC	Encrypted CRC8 check value before CRC

lock->APP

byte	Item	Description
0-1	CRC	Encrypted CRC16 check value before CRC (From 2-19byte)
2-3	N_PACK	The number of packets of data
4-19	DATA	Data content(fixed 16 bytes, not enough 16 bytes to fill 0x00)

Description of system information format:

Information item: data, information item: data, information item: data, information item:,"

For example:

"APN:CMNET, IPMODE:0, IP:120.24.228.19, PORT:9666, QRCODE

: 54645 , VCODE:NB, "

Information item description:

Info item	Description
APN	SIM card APN
APNMODE	APN Authentication mode 0: Do not authenticate the user name and password. 1: Verify the user name and password
USER	APN user name
PW	APN password
IPMODE	Server address mode: 0 : IP 1: domain name
IP	Server IP or domain
PORT	Server PORT
QRCODE	MAXIMUM 32 CHAR
VCODE	Manufacturer name
VERSION	Firmware version

VDATA	Compile date
POWER	Battery level
IMEI	IMEI number
ICCID	SIM card ICCID number
SCOPOWER	Scooter power
MODEL	Communication module model
VPCB	IOT PCB version
VCONT	Scooter controller firmware version
VMETER	Scooter display firmware version
VBAT1	Scooter battery firmware version
VBAT2	Scooter BMS firmware version

Note 1: When no information is set or sent, the information item can be omitted or the information data can be written blank

4.5.24 reboot iot(0x41)

APP->lock -- iot will reboot directly

Byte	Item	Description
0-1	STX	Data header/frame header Fixed value: 0xA3A4
2	LEN	0x01
3	RAND	Random number
4	KEY	Communication key
5	CMD	0x41
6	DATA	Default 0x01
7	CRC	Encrypted CRC8 check value before CRC

5. Appendix I: Bluetooth encryption, Decryption process

1.Encryption: Take the operation KEY and 0x01 instructions to the lock as an example. 4F6D6E6957344758

item	index	hex(original)	hex(+0x32)	hex(xor 34)	calc CRC
STX	0	A3	A3	A3	A3
STX	1	A4	A4	A4	A4
len	2	08	08	08	08
rand	3	1E	50	50	50
key	4	00	0	1E	1E
cmd	5	01	01	1F	1F
data	6	4F	4F	51	51
data	7	6D	6D	73	73
data	8	6E	6E	70	70
data	9	69	69	77	77
data	10	57	57	49	49
data	11	34	34	2A	2A
data	12	47	47	59	59
data	13	58	58	46	46
crc	14				01

2.Decryption: Take the lock to the app to return the KEY as an example.

item	index	hex	step1	step2	Step3	Step4	Step5
stx	0	A3	A3		A3	A3	A3
stx	1	A4	A4		A4	A4	A4
len	2	2		2	2	2	2
rand	3	B0			B0	B0	7E(B0-32)
key	4	27			27	27	59(27^7E)
cmd	5	7F			7F	7F	01(7F^7E)
data (f)	7	7F			7F	7F	01(7F^7E)
data (key)	8	27			27	27	59(27^7E)
crc	9	1A			1A	1A	
?	8	0(IF HAVE)					
?	9	A(IF HAVE)					
?	10	B(IF HAVE)					
?	11	C(IF HAVE)					
?	12	D(IF HAVE)					
?	13	E(IF HAVE)					

Step1:Find the subscript address of A3 A4

Step2:Find the location of len

Step3:According to the starting position and length of the instruction, get the instruction

Step4:Detect CRC value

Step6::Parse the instruction to get the required value.

6. Appendix II:Bluetooth broadcast data

Manufacturer data shows

Eg:

Data	Description
FFFF	ID
D713315DDBF6	MAC address: D7:13:31:5D:DB:F6
85	Device type low byte
00	Device type High type
29	IOT operating voltage 0x29->41->4.1V
00	Lock status 0->Off lock status 1->Unlock status
37	Scooter power 0x37->55->55%

0xFFFFD713315DDBF68500290037


```

0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40
};

```

```

unsigned char CRCLo[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06,
0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD,
0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A,
0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4,
0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3,
0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4,
0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29,
0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED,
0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60,
0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67,
0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68,
0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE, 0x7E,
0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71,
0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92,
0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B,
0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B,
0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42,
0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};

```

```

unsigned int CRC16(unsigned char * pucFrame, unsigned int usLen)
{
    unsigned char ucCRChi = 0xFF;

```

```

unsigned char ucCRCLo = 0xFF;
unsigned int iIndex=0x0000;

while(usLen--)
{
    iIndex = ucCRCLo ^ *(pucFrame++);
    ucCRCLo = ucCRChi ^ CRChi[iIndex];
    ucCRChi = CRCLo[iIndex];
}
return (unsigned int)(ucCRChi << 8 | ucCRCLo);
}

```