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Network Communication Protocol

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1 Introduction

1.1 Writing purpose

Describe the network communication interface, process, and precautions of our MDVR products and platform software as much as possible, so as to facilitate the writing of our CMS and related SDKs, and compile firmware products compatible with our equipment for third-party manufacturers.

1.2 References

GB/T2260 Administrative Region Planning Code of the People's Republic of China

GB/T19056 Car driving recorder

JT/T808-2019 "Terminal Communication Protocol and Data Format of Satellite Positioning System for Road Transport Vehicles"

JT/T1078-2016 "Road Transport Vehicle Satellite Positioning System Vehicle Video Communication Protocol"

Include the documentation referenced in the above

1.3 Terms and Abbreviations

GPS: Global Position System

MDVR: Mobile Digital Video Recorder, mobile digital video recorder.

CMS: Center Monitor System

Device: ie MDVR. Since they are all in-vehicle applications, they are sometimes called in-vehicle devices or in-vehicle machines.

Platform: The central server is CMS.

2 Network protocol

2.1 type of data

Table 2.1

type of data	Illustrate
BYTE	8-bit unsigned integer
WORD	16-bit unsigned integer
DWORD	32-bit unsigned integer
BYTE[n]	N bytes
BCD[n]	8421 code, n bytes
STRING	String code character/GBK encoding

Note: Protocol data is stored in big-endian mode.

2.2 Message structure

Each message consists of "identification bit, message header, message body, check code".

As shown in the figure:

Table 2.2

identification bit	header	message body	check code	identification bit
0x7e	Table 2.2.2	Corresponding message type	1 BYTE	0x7e

2.2.1 Identification bit

It is represented by 0x7e. If 0x7e and 0x7d appear in "check code, message header and message body", escape processing is required. Escape processing is defined as follows:

'0x7d' escapes to fixed 2 bytes '0x7d 0x01'

'0x7e' escapes to fixed 2 bytes '0x7d 0x02'

The escaping process is as follows:

When sending a message: message encapsulation → calculation and filling of the verification code → escape;

When receiving a message: Escape recovery → verify check code → parse the message.

Example: Send a packet of '0x30 0x7E 0x08 0x7d 0x55', after escaping, it will be encapsulated as follows '0x30 0x7d 0x02 0x08 0x7d 0x01 0x55'

2.2.2 Header

Table 2.2.2

start byte	field	type of data	description and requirements
0	message ID	WORD	
2	Properties	WORD	See Message Body Properties (Table 2.2.2.1)
4	Protocol version	BYTE	Protocol version number, incremented with each revision, the initial value is 1
5	Terminal phone number	BCD[10]	According to the conversion of the mobile phone number of the terminal itself after installation, if the mobile phone number is less than 12 digits, add the number 0 in front
15	Message serial number	WORD	Circular accumulation starting from 0 according to the sending order
17	Message Packet Encapsulation Item	—	If the relevant identification bit in the message body attribute determines the packet

			processing of the message, the item has content, otherwise there is no item.
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Table 2.2.2.1 Message Body Properties

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved	Version ID	Multiple packages	Data encryption method			message body length									

Version ID:

The version before JTT808-2019 is 0, and this protocol is fixed to **1**

Multiple packages:

When the 13th bit in the message body attribute is 1, it indicates that the message body is a long message, which is divided into multiple packets for sending and processing, and the specific packet information is determined by the message packet encapsulation item. If bit 13 is 0, there is no packet encapsulation item field in the message header (Table 2.2.3.2).

Table 2.2.3.2

Start byte	Field	Type of data	Description
0	Total number of packages	WORD	total number of message packets
2	package serial number	WORD	start from 1

Data encryption method

Bit10~bit12 are data encryption identification bits. When all three bits are 0, it means that the message body is not encrypted; when bit10 is 1, it means that the message body is encrypted by the RSA algorithm. The others are reserved.

2.2.3 message body

The message body is the content of the protocol instruction

2.2.4 check code

The check code is calculated from the first byte of the message header and XORed with the next byte until the end of the last byte of the message body; the check code is one byte.

2.3 way of communication**2.3.1 Connect the platform**

TCP communication is used between the device and the platform. After the device establishes a connection with the platform, it actively sends a registration message; after the device receives the correct response from the platform, it sends an authentication message; after the device receives the correct response, it considers the device to connect to the platform successfully.

2.3.2 Stay connected

After the device is connected to the platform, it needs to send a heartbeat packet. The interval can be negotiated. The default is 30s. The platform must respond after receiving the heartbeat packet. If the heartbeat packet is not received or the response is not received within 3 times of the interval, it is considered that the connection between the device and the platform is disconnected.

2.3.3 Response method

For each message, both parties need to give a response. The response is divided into a general response and a proprietary response. When the response type is not specified, the general response is used.

3 Protocol command (message body)

3.1 General answer

Device side:

Message ID: 0x0001

Message Structure: Table 3.1.1

Table 3.1.1

Start byte	Field	Type of data	Describe
0	Reply serial number	WORD	Corresponding platform message serial number
2	Reply ID	WORD	Corresponding platform message ID
4	Result	BYTE	0: success; 1: failure; 2: message error; 3: not supported

Platform side:

Message ID: 0x8001

Message Structure: Table 3.1.2

Table 3.1.2

Start byte	Field	Type of data	Describe
0	Reply serial number	WORD	Corresponding device message serial number
2	Reply ID	WORD	Corresponding device message ID
4	Result	BYTE	0: success; 1: failure; 2: message error; 3: not supported

3.2 heartbeat message

Device side:

Message ID: 0x0002

message structure: none

3.3 Device registration message

Device side:

Message ID: 0x0100

Message Structure: Table 3.3.1

Table 3.3.1

Start byte	Field	Type of data	Describe
0	Province ID	WORD	Indicates the province where the terminal installation vehicle is located, 0 is reserved, and the platform takes the default value. The provincial ID adopts the first two digits of the six digits of the administrative division code specified in GB/T 2260.
2	County ID	WORD	Indicates the city and county where the terminal installation vehicle is located, 0 is reserved, and the platform takes the default value. The city and county ID adopts the last four digits of the six digits of the administrative division code stipulated in GB/T 2260.
4	Manufacturer ID	BYTE[11]	Local administrative division code (6 bytes) and manufacturer (5 bytes)
15	Terminal model	BYTE[30]	Manufacturer-defined model, add 0 before the number of digits is insufficient
45	Terminal ID	BYTE[30]	Manufacturer-defined ID, add 0 before the number of digits is insufficient
75	license plate color	BYTE	When the vehicle is not registered, it is marked with 0. The rest are in accordance with the provisions of JTT697.7-2014
76	license plate	STRING	Motor vehicle license plate issued by public security traffic management department

platform response message:

Message ID: 0x8100

Message structure: Table 3.3.2

Table 3.3.2

Start byte	Field	Type of data	Describe
0	Reply serial number	WORD	Corresponding device message serial number
2	Result	BYTE	0: successful; 1: the vehicle has been registered; 2: the vehicle is not in the database; 3: the terminal has been registered; 4: the terminal is not in the database
4	Authentication code	STRING	This field is only generated after success

3.4 Device authentication

Device side:

Message ID: 0x0102

Message structure: Table 3.4

Table 3.4

Start byte	Field	Type of data	Describe
0	Authentication code length	BYTE	
1	Authentication code content	STRING	n is the length of the authentication code
n + 1	Terminal IMEI	BYTE[15]	Local administrative division code (6 bytes) and manufacturer (5 bytes)
n + 16	Firmware version number	BYTE[20]	Manufacturer-defined model, add 0 before the number of digits is insufficient

3.5 location information report

Device side:

Message ID: 0x0200

Message structure: consists of a list of location basic information and location additional information items (Table 3.5.1)

Table 3.5.1

Location Basic Information (Table 3.5.2)	Location Additional Information (Table 3.5.5)
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Table 3.5.2 Location Basic Information

Start byte	Field	Type of data	Describe
0	alarm sign	DWORD	Definition of alarm flags (Table 3.5.3)
4	condition	DWORD	Status Bit Definitions (Table 3.5.4)
8	latitude	DWORD	The latitude value in degrees multiplied by 10 to the 6th power is accurate to one millionth of a degree.
12	longitude	DWORD	The longitude value in degrees is multiplied by 10 to the 6th power to the nearest millionth of a degree.
16	high	WORD	Altitude, in meters.
18	speed	WORD	Unit (0.1km/h).
20	direction	WORD	0~359° , true north is 0, clockwise.
22	Time	BCD[6]	YY-MM-DD-hh-mm-ss (GMT+8 time, the time involved in this standard is in this time zone).

Table 3.5.3 Definition of alarm flags

Bit	Definition	Handling instructions
0	1: Emergency Alarm (SOS)	Triggered after the alarm switch is touched, and cleared after receiving the response
1	1: Overspeed alarm	The flag is maintained until the alarm condition is released

2	1: Fatigue driving	The flag is maintained until the alarm condition is released JT/T808-201115 / 33
4	1: GNSS module failure	The flag is maintained until the alarm condition is released
5	1: GNSS antenna not connected or cut off	The flag is maintained until the alarm condition is released
6	1: GNSS antenna short circuit	The flag is maintained until the alarm condition is released
8	1: The main power supply of the terminal is powered off	The flag is maintained until the alarm condition is released
14	1: Fatigue driving warning	The flag is maintained until the alarm condition is released
18	1: Cumulative driving overtime on the day	The flag is maintained until the alarm condition is released
19	1: Overtime parking	The flag is maintained until the alarm condition is released
29	1: Collision alarm	The flag is maintained until the alarm condition is released

Note: The functions corresponding to the unspecified data bits are not supported

Table 3.5.4 Definition of Status Bits

Bit	Status
0	0 Acc off; 1 Acc on
1	0 is not located; 1 is located
2	0 north latitude; 1 south latitude
3	0 east longitude; 1 west longitude
13	0: Door 1 closed; 1: Door 1 open (front door) (right front door of passenger car)
14	0: Door 2 closed; 1: Door 2 open (middle door)
15	0: Door 3 closed; 1: Door 3 open (rear door) (right rear door of passenger car)
16	0: Door 4 closed; 1: Door 4 open (driver's seat door) (left front door of passenger car)
18	0: GPS satellites are not used for positioning; 1: GPS satellites are used for positioning.
19	0: Do not use Beidou satellites for positioning; 1: Use Beidou satellites for positioning.
20	0: GLONASS satellites are not used for positioning; 1: GLONASS satellites are used for positioning.

21	0: Do not use Galileo satellites for positioning; 1: Use Galileo satellites for positioning.
22	0: The vehicle is in a stopped state; 1: The vehicle is in a running state

Note: The functions corresponding to the unspecified data bits are not supported

Table 3.5.5 Location Additional Information

Field	Type of data	Describe
Additional information ID	BYTE	1~255
Additional information length	BYTE	
Additional information	indefinite length	Additional Information ID (Table 3.5.6)

Table 3.5.6 Additional Information IDs

Additional information ID	Additional information length	describe
0x01	4	Mileage, DWORD, unit 0.1km, corresponding to the odometer reading on the vehicle
0x02	2	Fuel quantity, WORD, unit 0.1L, corresponding to the reading of the fuel gauge on the vehicle
0x03	2	Speed obtained by the tachograph, WORD, 0.1km/h
0x25	4	Extended Vehicle Signal Status Bits (Table 3.5.7)
0x2A	2	IO Status Bits (Table 3.5.8)
0x30	1	BYTE, wireless communication network signal strength
0x31	1	BYTE, the number of GNSS positioning stars

Table 3.5.7 Extended vehicle signal status bits

Bit	status
9	0 air conditioner off; 1 air conditioner on

Note: The functions corresponding to the unspecified data bits are not supported

Table 3.5.8 IO Status Bits

Bit	status
8	Corresponding device IoInput1
9	Corresponding device IoInput2
10	Corresponding device IoInput3
11	Corresponding device IoInput4
12	Corresponding device IoInput5
13	Corresponding device IoInput6

14	Corresponding device IoInput7
15	Corresponding device IoInput8

Note: The functions corresponding to the unspecified data bits are not supported

3.6 Bulk location information reporting

Device side:

Message ID: 0x0704

Message structure: Table 3.6.1

Table 3.6.1

Start byte	Field	Type of data	Describe
0	number of data items	WORD	Greater than 0
2	type of data	BYTE	0: Batch report for normal position 1: Supplementary report for blind area
3	location reporting data item	-	Table 3.6.2

Table 3.6.2 Location Data Items

Start byte	Field	Type of data	Describe
0	data body length	WORD	data body length n
2	data body	BYTE[n]	See 3.5 Location Information Reporting

3.7 Multimedia event upload

Device side:

Message ID: 0x0800

Message Structure: Table 3.7.1

Table 3.7.1

Start byte	Field	Type of data	Describe
0	multimedia data ID	DWORD	Greater than 0
4	Multimedia Type	BYTE	0: Image; 1: Audio; 2: Video
5	multimedia format	BYTE	0: JPEG; others reserved
6	event coding	BYTE	0: The platform issues an instruction; 1: Timing action; other reservations
7	channel ID	BYTE	

3.8 Multimedia data upload

Device side:

Message ID: 0x0801

Message structure: Table 3.8.1

Table 3.8.1

Start byte	Field	Type of data	Describe
0	multimedia data ID	DWORD	Greater than 0
4	Multimedia Type	BYTE	0: Image; 1: Audio; 2: Video
5	multimedia format	BYTE	0: JPEG; others reserved
6	event coding	BYTE	0: The platform issues an instruction; 1: Timing action; other reservations
7	channel ID	BYTE	
8	location information	BYTE[28]	0x200 message body, only contains basic location information, no additional information
36	multimedia packet		

platform response message:

message ID: 0x8800

Message Structure: Table 3.8.2

Table 3.8.2

Start byte	Field	Type of data	Describe
0	multimedia data ID	DWORD	>0, no subsequent fields if all packets are received
4	Total number of retransmitted packets	BYTE	n
5	List of retransmission packet IDs	BYTE[2*n]	The sequence numbers of the retransmission packets are arranged in order, such as "packet ID1 packet ID2...packet IDn".

Note: The response to this message should use the 0x0801 message to retransmit the sub-packet in the retransmission ID list once, which is exactly the same as the original sub-packet message.

3.9 Collect and report driver identity information

Device side:

message ID: 0x0702

Message Structure: Table 3.9.1

Table 3.9.1

Start byte	Field	Type of data	Describe
0	status	BYTE	0x01: The IC card of the qualification certificate is inserted (the driver goes to work); 0x02: The IC card of the qualification certificate is pulled out (the driver gets off work).
1	Time	BCD[6]	Card insertion/removal time, YY-MM-DD-hh-mm-ss; The following fields are only valid and populated when the status is 0x01.
7	Card reading result	BYTE	0x00: IC card reading is successful; 0x01: Card reading failed because the card key authentication failed;

			0x02: Card reading failed because the card has been locked; 0x03: Card reading failed because the card was pulled out; 0x04: Card reading failed due to data verification error. The following fields are only valid when the IC card read result is equal to 0x00.
8	Driver's name length	BYTE	n
9	driver name	STRING	
9 + n	Qualification certificate code	STRING	The length is 20 digits, if it is insufficient, 0x00 is added.
29 + n	The length of the name of the issuing authority	BYTE	m
30 + n	Issuing agency name	STRING	
30 + n + m	Certificate validity	BCD[4]	YYYYMMDD
34 + n + m	identification number	STRING	The length is 20 digits, if it is insufficient, 0x00 is added.

3.10 Data transparent transmission

Device side:

message ID: 0x0900

Message structure: Table 3.10.1

Platform side:

message ID: 0x8900

Message structure: Table 3.10.1

Table 3.10.1

Start byte	Field	Type of data	Describe
0	Transparent message type	BYTE	Message Type (Table 3.10.2)
1	Transparent data	-	0: Image; 1: Audio; 2: Video

Table 3.10.2 Transparent message types

message type	description and requirements
0xF0-0xFF	User-defined transparent message
0xF0	Transparent transmission of gps data (data structure table 3.10.3)

Table 3.10.3 Data structure of GPS transparent transmission message

Start byte	Field	Type of data	Describe
0	Transmission type	BYTE	0:normal data 1:retransmit data
1	alarm sign	DWORD	Definition of alarm flags (Table 3.5.3)
5	state	DWORD	Status Bit Definitions (Table 3.5.4)
9	latitude	DWORD	The latitude value in degrees is multiplied by 10 to the sixth power, accurate to one millionth of a degree.
13	longitude	DWORD	The longitude value in degrees is multiplied by 10 to the sixth power, accurate to one millionth of a degree.
17	high	WORD	Altitude, in meters.
19	speed	WORD	Unit (0.1km/h).
21	direction	WORD	0~359, true north is 0, clockwise.
23	time	HEX[6]	YY-MM-DD-hh-mm-ss(GMT+8 time, the time involved in this standard is in this time zone).
29	mileage	DWORD	Unit: 0.1km
33	oil quantity	WORD	Unit: 0.1L
35	vehicle status	DWORD	
37	network signal value	BYTE	0-100
38	number of satellites	BYTE	
39	driver's license number	BYTE[24]	
63	driving time	DWORD	Unit: min
65	historical speed count	BYTE	N-1 (Number of GPS uploaded according to menu configuration-1). For example: the device menu is set to 30, here it is equal to 29
66	historical speed value	WORD[n-1]	Unit (0.1km/h). For example, the menu sets 30 speed values, and here 29 speed values before the 30th second are passed.

3.11 Real-time audio and video preview request

Platform side:

message ID: 0x9101

Message structure: Table 3.11.1

Table 3.11.1

Start byte	Field	Type of data	Describe
0	Server IP length	BYTE	length n
1	Server IP address	STRING	IP address of the audio and video server to be connected
1 + n	TCP port	WORD	
3 + n	UDP port	WORD	
5 + n	channel number	BYTE	start from 1
6 + n	type of data	BYTE	0: Audio and video; 1: Video; 2: Intercom; 3: Monitor
7 + n	Stream type	BYTE	0: main stream; 1: sub stream

The platform sends this message when it needs to preview audio and video. After receiving this message, the device will give a general response, and then establish a new connection with the designated video server. The previous communication connection remains unchanged, video data transmission see 3.13

3.12 Real-time audio and video preview transmission control

Platform side:

message ID: 0x9102

Message structure: Table 3.12.1

Table 3.12.1

Start byte	Field	Type of data	Describe
0	channel number	BYTE	start from 1
1	Control instruction	BYTE	0: Turn off the audio and video transmission command 1: switch stream 2: Pause sending stream 3: Resume the stream transmission before the pause 4: Turn off the intercom
2	Turn off audio and video types	BYTE	0: Turn off the audio and video of the corresponding channel 1: Turn off the audio of the corresponding channel and keep the video 2: Turn off the video of the corresponding channel and keep the audio
3	switch stream	BYTE	0: main stream; 1: sub stream

3.13 Audio and video data transmission

Device side:

When the device receives a video request from the platform, it uses the specified packet format (Table 3.13.1) to transmit data in the newly established connection. This packet format is extended on the basis of the IETF RFC 3550 RTP protocol.

Table 3.13.1 Video Transmission Packets

Start byte	Field	Type of data	Describe
0	frame header	DWORD	Fixed to 0x30316364
4	V	2 bits	fixed at 2
	P	1 bit	fixed at 0
	X	1 bit	fixed at 0
	C	4 bits	fixed at 1
5	M	1 bit	Flag bit to confirm whether it is a complete data boundary
	PT	7 bits	Load Type (Table 3.13.2)
6	package serial number	WORD	The initial value is 0. Each time an RTP packet is sent, the sequence number is incremented by 1.
8	SIM card number	BCD[6]	Terminal SIM card number
14	channel number	BYTE	start from 1
15	type of data	4 bits	0000: Video I frame 0001: Video P frame 0010: Video B frame 0011: Audio frame 0100: Transparent transmission other reservations
	Multi-packet processing flags	4 bits	0000: Atomic packet, not splittable 0001: The first packet in multi-packet processing 0010: The last packet when processing multiple packets 0011: Intermediate package when processing multiple packages
16	timestamp	BYTE[8]	Identifies the time (ms) corresponding to the current audio and video data packet, non-audio and video data does not have this field
24	I frame interval	WORD	Time interval (ms) between adjacent I frames in video data, non-video frames do not have this field
26	frame interval	WORD	The time interval (ms) between adjacent frames in the video data, non-video frames do not have this field
28	data body length	WORD	
30	data body	BYTE[n]	The length of the data body does not exceed 950 bytes

Table 3.13.2 Load Types

load type	load name	describe
6	G. 711A	audio
7	G. 711U	audio
8	G. 726	audio
91	Transparent transmission	audio
98	H. 264	audio
99	H. 265	audio

3.14 Query the list of audio and video resources

Platform side:

message ID: 0x9205

Message structure: Table 3.14.1

Table 3.14.1

Start byte	Field	Type of data	Describe
0	channel number	BYTE	start from 1
1	Starting time	BCD[6]	YYMMDDHHMMSS
2	End Time	BCD[6]	YYMMDDHHMMSS
13	alarm sign	64 bits	0 means to search all resources, others are reserved
21	Resource Type	BYTE	0: audio and video; 1: audio; 2: video; 3: audio or video
22	Stream type	BYTE	0: all code streams; 1: main code stream; 2: sub code stream
23	memory type	BYTE	0: All memory

device response:

message ID: 0x1205

Message structure: Table 3.14.2

Table 3.14.2

Start byte	Field	Type of data	Describe
0	serial number	WORD	The serial number corresponding to the query command
1	Total resources	DWORD	The number of resources that meet the query requirements
2	List of resources		See the data structure (Table 3.14.3)

Table 3.14.3 List of resources

Start byte	Field	Type of data	Describe
0	channel number	BYTE	start from 1
1	Starting time	BCD[6]	YYMMDDHHMMSS

2	End Time	BCD[6]	YYMMDDHHMMSS
13	alarm sign	64 bits	0 means to search all resources, others are reserved
21	Resource Type	BYTE	0: audio and video; 1: audio; 2: video
22	Stream type	BYTE	1: Main stream; 2: Sub stream
23	memory type	BYTE	0: All memory
24	File size	DWORD	Unit (byte)

3.15 Audio and video playback request

Platform side:

message ID: 0x9201

Message structure: Table 3.15.1

Table 3.15.1

Start byte	Field	Type of data	Describe
0	Server IP length	BYTE	length n
1	Server IP address	STRING	IP address of the audio and video server to be connected
1 + n	TCP port	WORD	
3 + n	UDP port	WORD	
5 + n	channel number	BYTE	start from 1
6 + n	type of data	BYTE	0: audio and video; 1: audio; 2: video; 3: audio or video
7 + n	Stream type	BYTE	0: Main stream; 1: Substream; 0 when transmitting audio
8 + n	memory type	BYTE	0: All memory
9 + n	Playback method	BYTE	0: normal playback 1: Fast forward playback 2: keyframe fast rewind playback 3: Keyframe playback
10 + n	Fast forward or rewind multiples	BYTE	Valid when playback mode is 1 or 2 0: invalid 1: 1 times 2: 2 times 3: 4 times 4: 8 times 5: 16 times When the playback mode is 0, the multiplier is 0xff, and the data is sent at the fastest speed to download the video quickly
11 + n	Starting time	BCD[6]	YYMMDDHHMMSS
17 + n	End Time	BCD[6]	YYMMDDHHMMSS

The platform sends this message when it needs to play back the audio and video of the device. After receiving this message, the device will give a general response, and then establish a new connection with the designated video server. The previous communication connection remains

unchanged, video data transmission see 3.13

3.16 Audio and video playback control

Platform side:

Message ID: 0x9202

Message structure: Table 3.16.1

Table 3.16.1

Start byte	Field	Type of data	Describe
0	channel number	BYTE	start from 1
1	playback control	BYTE	0: Start playback 1: Pause playback 2: End playback 3: Fast forward playback 4: Keyframe fast rewind playback 5: Drag playback 6: Keyframe playback
2	Fast forward or rewind multiples	BYTE	Valid when playback mode is 3 or 4 0: invalid 1: 1 times 2: 2 times 3: 4 times 4: 8 times 5: 16 times
3	Drag playback position	BCD[6]	YYMMDDHHMMSS, valid when playback mode is 5