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GNSS system for operating vehicles - Video communication protocol

道路运输车辆卫星定位系统视频通信协议

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GNSS system for operating vehicles - Video communication protocol

1 Scope

This standard specifies the protocol basis and communication protocol between the vehicle-mounted video terminal and the video platform in the satellite positioning system of the road transport vehicle, the code-stream communication between the audio-video stream server and the client's playing software, the communication protocol basis, communication protocol flow, constant definition, protocol data volume's format between the video platforms.

This standard is applicable to the transmission of audio-video data between the vehicle-mounted video terminal of the satellite positioning system of the road transport vehicle and the enterprise's video surveillance platform, as well as the exchange and sharing of audio-video resources between different video platforms.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

JT/T 808-2011 GNSS system for operating vehicles - General specifications for vehicle terminal communication protocol and data-format

JT/T 809-2011 GNSS system for operating vehicles - General specifications for data exchange between platforms

JT/T 1076-2016 GNSS system for operating vehicles - Technical specification for onboard video terminals

JT/T 415-2006 Electronic government platform for administration of road transportation - Cataloguing and coding rules

IETF RFC 3550 Real-time transport protocol (RTP)

IETF RFC 2854 The Text/Html media type

platform

4.1 Basic agreement of protocol

The communication method, data type, transmission rules and message composition of the protocol are in accordance with the requirements of clause 4 of JT/T 808-2011.

The communication connection mode of the signaling data message in the protocol is in accordance with the requirements of clause 5 of JT/T 808-2011.

The message processing mechanism of the signaling data message in the protocol is in accordance with the requirements of clause 6 of JT/T 808-2011.

The encryption mechanism of the signaling data message in the protocol is in accordance with the requirements of clause 7 of JT/T 808-2011.

The parties to the protocol for platform and terminal communication shall meet the following requirements:

- Unless otherwise specified, all messages shall be responded;
- If a dedicated response message is not explicitly specified, it shall use the universal response reply;
- For messages with sub-packet, the responder shall respond on a packet-by-packet basis for each sub-packet message.

4.2 Convention on real-time audio-video transmission channel

A real-time audio-video transmission channel may either transmit one channel of video information or one channel of audio information, or transmit one channel of video information and one channel of audio information. There are two types of conventions on the real-time audio-video transmission channel:

- When using the TCP method, each TCP connection may carry multiple audio-video channels. If there is no data transmission within the set timeout period, both the terminal and the monitoring center may actively close the TCP connection which is used for audio-video data transmission.
- When using UDP method, each UDP port may carry multiple audio-video channels.

Table 2 (continued)

Start byte	Field	Data type	Description and requirements
10	Storage stream resolution	BYTE	0: QCIF 1: CIF; 2: WCIF; 3: D1; 4: WD1; 5: 720P; 6: 1080P; 100 ~ 127: Customized
11	Storage stream key frame interval	WORD	Range (1 ~ 1000) frames
13	Storage stream target frame rate	BYTE	Range (1 ~ 120) frames / s
14	Storage stream target code rate	DWORD	Unit in thousand bits per second (kbps)
18	OSD subtitle overlay settings	WORD	Bitwise setting: 0 means no overlay, 1 means overlay bit0: date and time; bit1: the license plate's number; bit2: logical channel's number; bit3: latitude and longitude; bit4: travel recording speed; bit5: satellite positioning speed; bit6: continuous driving time; bit7 ~ bit10: reserved; Bit11 ~ bit15: customized
20	Whether to enable audio output	BYTE	0: not enabled; 1: enabled

Table 3 -- Audio-video channel list

Start byte	Field	Data type	Description and requirements
0	Total number of audio-video channels	BYTE	Represented by 1
1	Total number of audio channels	BYTE	Represented by m
2	Total number of video channels	BYTE	Represented by n
3	Comparison of audio-video channels	BYTE [4 x (1 + m + n)]	See Table 4

Table 4 -- Comparison of audio-video channels

Start byte	Field	Data type	Description and requirements
0	Physical-channel's number	BYTE	Started from 1
1	Logical-channel number	BYTE	According to Table 2 in JT/T 1076-2016

Table 4 (continued)

Start byte	Field	Data type	Description and requirements
2	Channel type	BYTE	0: Audio-video; 1: Audio; 2: Video

5.3.3 Terminal upload audio-video attributes

Message ID: 0x1003.

Message type: Signaling data message.

Use the command of terminal upload audio-video attributes, to respond to the message of querying terminal audio-video attributes as delivered by the platform. The data-format of the message-body is as shown in Table 11.

Table 11 -- Data-format of terminal upload audio-video attribute

Start byte	Field	Data type	Description and requirements
0	Input audio coding method	BYTE	See Table 12
1	Input audio channel's number	BYTE	
2	Input audio sample rate	BYTE	0: 8 kHz; 1: 22.05 kHz; 2: 44.1 kHz; 3: 48 kHz
3	Input audio sample bits	BYTE	0: 8-bit; 1: 16-bit; 2: 32-bit
4	Audio frame length	WORD	Range 1 ~ 4294967295
6	Whether it supports audio output	BYTE	0: not supported; 1: supported
7	Video coding method	BYTE	See Table 19
8	Maximum number of audio physical-channels as supported by the terminal	BYTE	
9	Maximum number of video physical-channels as supported by the terminal	BYTE	

Table 12 -- Definitions of audio-video coding type

Code	Name	Remarks
0	Reserved	
1	G.721	Audio
2	G.722	Audio
3	G.723	Audio
4	G.728	Audio
5	G.729	Audio

Message ID: 0x1005.

Message type: signaling data message.

The terminal equipment uses video analysis to count the passengers getting on and off, send the counting result to the platform. The format of the message-body data is as shown in Table 16.

Table 16 -- Data-format of terminal upload passenger-traffic

Start byte	Field	Data type	Description and requirements
0	Start-time	BCD [6]	YY-MM-DD-HH-MM-SS (GMT+ 8 time, the time involved hereinafter in this standard uses this time zone)
6	End-time	BCD [6]	YY-MM-DD-HH-MM-SS
12	Number of getting-on passengers	WORD	Number of getting-on passengers from the start-time to end-time
14	Number of getting-off passengers	WORD	Number of getting-off passengers from the start-time to end-time

5.5 Real-time audio-video transmission command

5.5.1 Real-time audio-video transmission request

Message ID: 0x9101.

Message type: signaling data message.

The platform requests real-time audio-video transmission from the terminal device, including real-time video transmission, active two-way voice-intercom, one-way monitoring, broadcast voice to all terminals, and specific passthrough. The message-body's data-format is as shown in Table 17. After receiving the message, the terminal replies to the video terminal with universal response, then establishes a transmission link through the corresponding server IP address and port number, then follow the audio-video streaming protocol to transmit the corresponding audio-video stream data.

Table 17 -- Data-format of real-time audio-video transmission request

Start byte	Field	Data type	Description and requirements
0	Length of server's IP address	BYTE	Length n
1	Server's IP address	STRING	Real-time video server's IP address
1 + n	Server video channel monitoring -port's number (TCP)	WORD	Real-time video server TCP port number
3 + n	Server video channel monitoring-port's number (UDP)	WORD	Real-time video server UDP port number
5 + n	Logical channel's number	BYTE	According to Table 2 in JT/T 1076-2016

16	Timestamp	BYTE [8]	Identify the relative time of the current frame of this RTP data packet, in milliseconds (ms). When the data type is 0100, there is no such field
24	Last I frame interval	WORD	The time interval between the frame and the previous keyframe, in milliseconds (ms). When the data type is non-video frame, there is no such field
26	Last frame interval	WORD	The time interval between the frame and the previous frame, in milliseconds (ms). When the data type is non-video frame, there is no such field
28	Length of data-body	WORD	Length of subsequent data-body, excluding this field
30	Data-body	BYTE [n]	Audio-video data or passthrough data, length not more than 950 byte

5.5.4 Real-time audio-video transmission status notification

Message: ID: 0x9105.

Message type: Signaling data message.

The platform sends a notification packet to the terminal according to the set time interval in the process of receiving the audio-video data as uploaded by the terminal. The data-format of the message-body is as shown in Table 20.

Table 20 -- Data-format of real-time audio-video transmission status notification

Start byte	Field	Data type	Description and requirements
0	Logical-channel number	BYTE	According to Table 2 in JT/T 1076-2016
1	Packet loss rate	BYTE	Packet loss rate of the current transmission channel, multiplied by 100 to take the integer part

5.6 Historical audio-video query, playback and download commands

5.6.1 Query resource list

Message ID 0x9205.

Message type: Signaling data message.

The platform queries the list of video-files from the terminal according to the combination of audio-video types, channel numbers, alarm types, start-time and end-time. The data-format of message-body is as shown in Table 21.

shown in Table 18.

6.2 Format of audio-video stream request URL command

After the government's video surveillance platform sends a real-time preview or remote playback request command to the enterprise's video monitoring platform and obtains a successful response, it obtains the IP address and port number of the audio-video streaming server. The client end of the government's video surveillance platform directly sends the URL command to the enterprise's audio-video streaming server, to obtain the audio-video stream data after establishing the link. The client end uses the browser plug-in or dedicated software to play it.

The audio-video stream request URL shall not be displayed in the interface. The command's format is defined as follows:

Http:// [server IP address]: [port number] / [license plate number]. [license plate color]. [logical-channel number]. [audio-video logo]. [time-based password]

The data items of the audio-video stream request URL command are as defined in Table 35.

Table 35 -- Definitions of data items of audio-video stream request URL command

Field		Description and requirements
Address attribute information	Server IP address	Audio-video stream server IP address
	Port number	Audio-video stream service port number
	License plate number	It shall use the UTF-8 coding, uniformly convert it to the application/x-www.form-URLencoded MIME format in IETF RFC 2854
	License plate color	According to the provisions of 5.4.12 of JT/T 415-2006
	Logical-channel number	According to Table 2 of JT/T 1076-2016, where 0 indicates all channels
	Audio-video flag	0: audio-video; 1: audio; 2: video
Additional information	Time-based password	Generated by the enterprise's platform server, the time-based password of the client end of the government's platform of the belonged district is different from the time-based password of the government's platform of cross-domain district. The time-based password shall consist of only English letters (including uppercase and lowercase) and Arabic numerals. The length is 64 ASCII characters and shall be updated every 24 hours

upload requests to the enterprise's video monitoring platform. After receiving the request, the enterprise's video monitoring platform shall respond to the government's video surveillance platform. If the response is successful, the government's video surveillance platform requests real-time audio-video data from the video server IP and port as specified by the enterprise's video monitoring platform.

8.2.2 Enterprise's video monitoring platform stops uploading audio-video data to the government's video surveillance platform in real-time

The government's video surveillance platform sends a request to stop the real-time audio-video upload to the enterprise's video monitoring platform. After receiving the request, the enterprise's video monitoring platform shall respond to the government's video surveillance platform. If the response is successful, the enterprise's video monitoring platform stops sending real-time audio-video data to the government's video surveillance platform.

8.3 Remote video searching services

8.3.1 Government's video surveillance platform obtains audio-video resource directory from enterprise's video monitoring platform

The government's video surveillance platform sends a request for accessing the audio-video resource directory to the enterprise's video monitoring platform. After receiving the request, the enterprise's video monitoring platform shall immediately search the latest audio-video resource directory from the terminal and update the local directory, respond to the government's video surveillance platform. If the response is successful, the enterprise's video monitoring platform sends the audio-video resource directory data to the government's video surveillance platform.

8.3.2 Enterprise's video monitoring platform actively uploads audio-video resource directory to government's video surveillance platform

After receiving the special-alarm information uploaded by the terminal, the enterprise's video monitoring platform waits for the complete recording of the video information, and shall search the latest audio-video resource directory with the special-alarm identifier from the terminal, update the local directory, actively upload the audio-video resource directory to the government's video surveillance platform.

8.4 Remote video download services

8.4.1 Government's video monitoring platform downloads video data from enterprise's video surveillance platform

Message direction: higher-level government's video surveillance platform to cross-domain government's video surveillance platform

Sub-service type identifier: DOWN_AUTHORIZE_MSC_STARTUP_REQ_ACK

Description: The upper-level government's video surveillance platform responds to the time-based password request message as sent by the cross-domain government's video surveillance platform, the upper-level government's video surveillance platform determines the response content according to the geographic location of the requesting vehicle within 5 minutes. The data-body is as shown in Table 41.

Table 41 -- Data-body of response message to time-based password request

Field	Byte number	Data type	Description and requirements
VEHICLE_NO	21	Octet String	License plate number
VEHICLE_COLOR	1	BYTE	License plate color, according to the provisions of 5.4.12 of JT/T 415-2006
DATA_TYPE	2	uint16_t	Identifier of sub-service type
DATA_LENGTH	4	uint32_t	Data length of subsequent 2 fields

10.2 Real-time audio-video services

10.2.1 Real-time audio-video request message

Link type: sub-link

Message direction: Initiator's platform to receiver's platform

Sub-service type identifier: DOWN_REALVIDEO_MSG_STARTUP.

Description: The government's video surveillance platform sends the command to the enterprise's video monitoring platform, the upper-level government's video surveillance platform or the cross-domain government's platform send the command to the government's platform of the belonging district, to request the real-time audio-video of the vehicle. The data-body is as shown in Table 42.

Table 42 -- Data-body of real-time audio-video request

Field	Byte number	Data type	Description and requirements
VEHICLE_NO	21	Octet String	License plate number
VEHICLE_COLOR	1	BYTE	License plate color, according to the provisions of 5.4.12 of JT/T 415-2006
DATA_TYPE	2	uint16_t	Identifier of sub-service type

RESULT	1	BYTE	Response result, defined as follows: 0x00: succeeded; 0x01: failed; 0x02: not supported: 0x03: session ended

10.3 Remote video searching

10.3.1 Actively upload audio-video resource directory information message

Link type: main-link

Message direction: the lower-level platform to upper-level platform

Sub-service type identifier: UP_FILELIST_MSG.

Description: The enterprise's video monitoring platform actively sends an audio-video resource directory with special-alarm identifiers to the government's video surveillance platform, or the lower-level government's platform actively sends an audio-video resource directory with special-alarm identifiers to the higher-level government's platform. The data-body is as shown in Table 46.

Table 46 -- Data-body of actively uploading audio-video resource directory

Field	Byte number	Data type	Description and requirements
VEHICLE_NO	21	Octet String	License plate number
VEHICLE_COLOR	1	BYTE	License plate color, according to the provisions of 5.4.12 of JT/T 415-2006
DATA_TYPE	2	uint16_t	Identifier of sub-service type
DATA_LENGTH	4	uint32_t	Data length of the subsequent 2 fields
ITEM_NUM	4	uint32_t	Total number of resource directory items
ITEM_LIST			List of resource directory items, as shown in Table 47

Table 47 - Format of upload audio-video resource directory item list

Field	Byte number	Data type	Description and requirements
CHANNEL_ID	1	BYTE	Logical-channel number, according to Table 2 of JT/T 1076-2016; 0 means all channels
START_TIME	8	time_t	UTC time
END_TIME	8	time_t	UTC time
ALARM_TYPE	8	64BITS	bit0~31 are defined according to the alarm flag bits in Table 18 of JT/T 808-2011; bit32~63 are as shown in Table 10
AVITEM_TYPE	1	BYTE	Audio-video type, defined as follows:

lower-level government's platform responds to the audio-video resource directory to the higher-level government's platform. The data-body is as shown in Table 50.

Table 50 -- Data-body of response to query audio-video resource directory

Field	Byte number	Data type	Description and requirements
VEHICLE_NO	21	Octet String	License plate number
VEHICLE_COLOR	1	BYTE	License plate color, according to the provisions of 5.4.12 of JT/T 415-2006
DATA_TYPE	2	uint16_t	Identifier of sub-service type
DATA_LENGTH	4	uint32_t	Data length of the subsequent 3 fields

Table 50 (continued)

Field	Byte number	Data type	Description and requirements
RESULT	1	BYTE	Response result, defined as follows: 0x00: succeeded; 0x01: failed; 0x02: not supported: 0x03: session ended; 0x04: time-based command error; 0x05: cross-domain conditions not satisfied
ITEM_NUM	4	DWORD	Total number of resource directory items
ITEM_LIST			List of resource directory items, as shown in Table 47

10.4 Remote video playback

10.4.1 Request message for remote video playback

Link type: sub-link

Message direction: Initiator's platform to receiver's platform

Sub-service type ID: DOWN_PLAYBACK_MSG_STARTUP.

Description: The government's video surveillance platform sends the command to request the audio-video recording of the vehicle to the enterprise's video monitoring platform, the upper-level government's platform sends the command to request the audio-video recording of the vehicle to the lower-level government's platform, or the cross-domain government's platform sends the command to request the audio-video recording of the vehicle to the government's platform of the belonging district. The data-body is as shown in Table 51.

Table 57 (continued)

Field	Byte number	Data type	Description and requirements
TCP_PORT	2	uint16_t	FTP port, it is valid when the RESULT is 0
USERNAME	49	Octet String	FTP username, it is valid when the RESULT is 0
PASSWORD	22	Octet String	FTP password, it is valid when the RESULT is 0
FILE_PATH	200	Octet String	File storage path, it is valid when the RESULT is 0

10.5.4 Response message to remote video download completion notice

Link type: sub-link

Message direction: government's video surveillance platform to enterprise's video monitoring platform

Sub-service type identifier: UP_DOWNLOAD_MSG_END_INFORM_ACK.

Description: The government's video surveillance platform responds to the download completion notice from the enterprise's video monitoring platform. The data-body is as shown in Table 58.

Table 58 -- Data-body of response to remote video download completion notice

Field	Byte number	Data type	Description and requirements
VEHICLE_NO	21	Octet String	License plate number
VEHICLE_COLOR	1	BYTE	License plate color, according to the provisions of 5.4.12 of JT/T 415-2006
DATA_TYPE	2	uint16_t	Identifier of sub-service type
DATA_LENGTH	4	uint32_t	Data length of the subsequent 2 fields
RESULT	1	BYTE	Response result: 0x00: succeeded; 0x01: failed; 0x02: not supported: 0x03: session ended
SESSION_ID	2	uint16_t	Corresponding to the serial number of the platform file upload message, it is valid when the RESULT is 0

10.5.5 Remote video download control request message

Link type: sub-link

Message direction: government's video surveillance platform to enterprise's video monitoring platform

Sub-service type identifier: DOWN_DOWNLOAD_MSC_CONTROL.

Description: The government's video surveillance platform sends download

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