VDEC Developer Guide

EIC7x series AI Digital SoC

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Change History

Version No	Date	Descriptions
v0.6	2024/7/1	Initial version.
v0.7	2024/12/17	Add chapter 5.Proc Debugging Information.

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1. Overview

1.1 Overview

The Video Decoder module, abbreviated as VDEC, is responsible for decompressing digital compressed video in H.264/265 and JEPG formats to obtain image streams in YUV/RGB formats. This module supports multi-channel decoding. This document mainly introduces the workflow of the VDEC module and the usage of related API interfaces.

The decoding specifications supported by the chip are shown in the following table.

Table 1-1 Chip decoding specifications

Hardware decoder	Maximum number of channels	Protocol	Maximum,minimum resolution	Input format	Output format
VDH JPEGD	128	**VDH:** H.264/H.265 **JPEGD:** JPEG/MJPEG	**VDH:** ● H.264:max 8192x8192, min 48x48 ● H.265:max 8192x8192, min 144x144 **JPEGD:** JPEG/MJPEG : max 32768x32768, min 48x48	**VDH:** ● H.264/H.265:8/10bit,YUV420 **JPEGD:** ●JPEG/MJPEG: 8bit YUV420,YUV422,YUV400,YUV411,YUV440,YUV444	**VDH:** Color depth:8-bit/P010 Plane:NV12,NV21,I420,YV12,YUV400, RGB(A/X), BGR(A/X),R16G16B16,B16G16R16 **JPEGD:** Color depth:8-bit Plane:NV12,NV21,I420,YV12,YUV400, RGB(A/X), BGR(A/X)

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1.2 Software flow

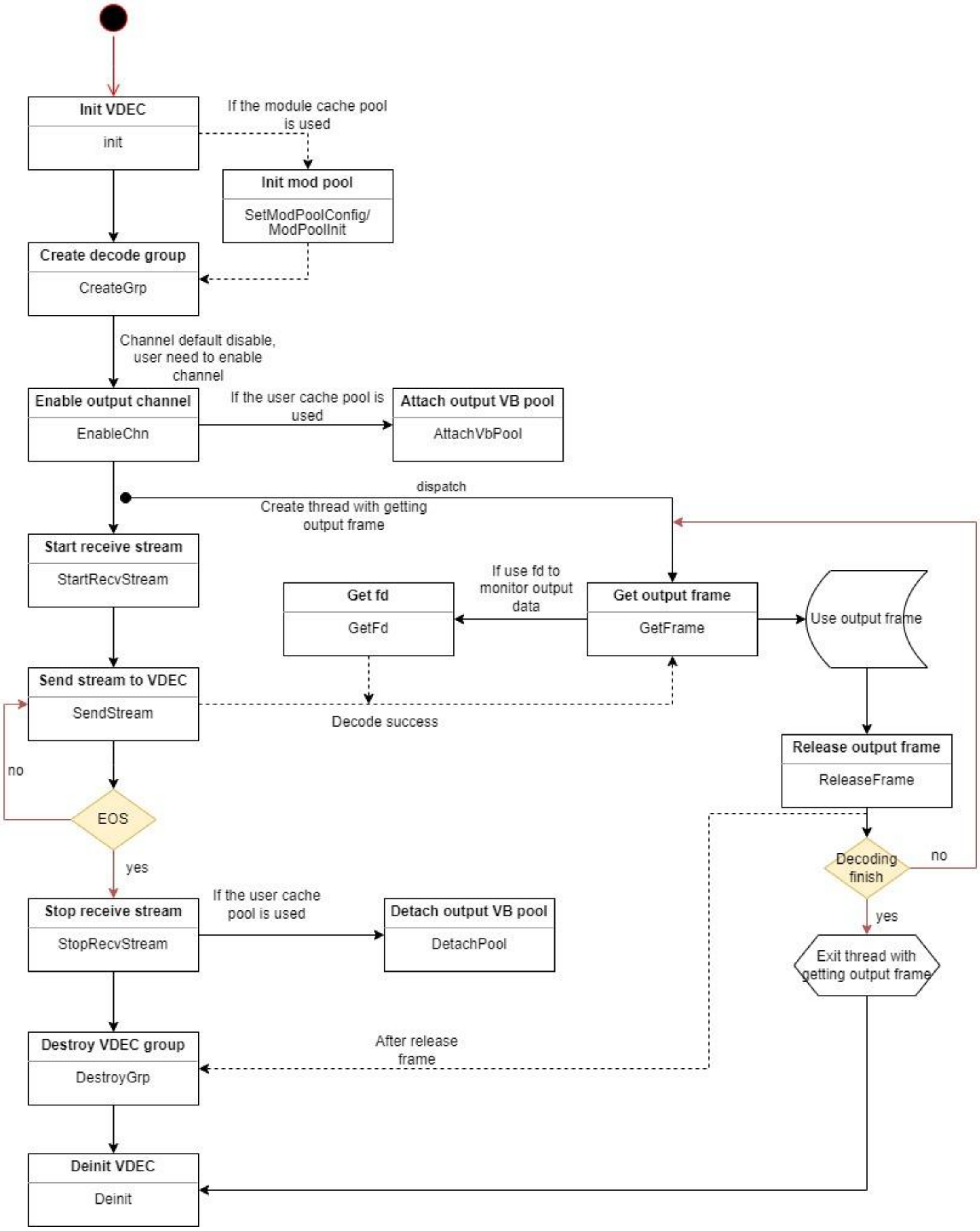

Figure 1-1Software flow

1.3 Concept

1.3.1 The method about sending stream

The VDEC decoder provides 3 methods about sending stream:

-Send by frame（VIDEO_MODE_FRAME）:Each time a user sends a complete frame of bitstream to the decoder, and each time the sending interface is called, the decoder considers that the frame of bitstream has ended and begins decoding the image. Therefore, it is necessary to ensure that the

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bitstream sent by each call to the sending interface must be one frame, otherwise decoding errors may occur. This transmission method can achieve the goal of fast decoding.

-Send by stream（VIDEO_MODE_STREAM）:Users can send any length of bitstream to the decoder each time, and the decoder completes the recognition process of one frame of bitstream internally. Not yet implemented, reserved.

-Send by compatibility mode（VIDEO_MODE_COMPAT）:It supports sending a frame of stream multiple times to the decoder, but at the end of each frame of stream, the frame end flag bEndOfFrame must be configured as ES_TRUE. Otherwise, it is considered that the current frame of code stream has not yet ended. Not yet implemented, reserved.

The mode for sending the stream can be set in the interface ES_VDEC_CreateGrp.

1.3.2 Output image method

According to the H.264/H265 protocol, decoded images may not be output immediately after decoding. The VDEC decoder can achieve the goal of outputting images as quickly as possible by setting different image output methods. The image output methods include the following two types:
-Decoding sequence: Decoded images are output in the order of decoding.
-Display sequence: Decoded images are output according to the H.264/H.265 protocol.
The image output method outputOrder can be set in the interface ES_VDEC_SetGrpParam.

1.3.3 PTS

When sending a bitstream in the VIDEO_MODE_FRAME mode, the decoded output image timestamp PTS is the PTS sent by the user in the sending bitstream interface (ES_VDEC_sendStream), and the decoder will not change this value; If the PTS value configured by the user is 0, it means that the user does not perform frame rate control, but rather the video output module (VO) performs frame rate control; If there are other values, it indicates that the video output module (VO) controls the frame rate based on the user set PTS value.
Note: There should be no mixing of PTS values of 0 and non-0.
When sending the stream in VIDEO_MODE_STREAM mode, the PTS of the decoded output image is uniformly set to 0, indicating that the user does not perform frame rate control, but rather the video output module (VO) performs frame rate control.

1.3.4 User picture

When the network is disconnected abnormally and there isn't stream sent from the front-end, users can insert a user picture to display on the VO, to indicate the current network abnormality or no stream to decode. VDEC provides 2 ways to insert user picture:
-Insert user picture immediately: VDEC will first clear the internal stream and picture of the decoder, and then insert the user picture.
-Delayed insertion of user picture: VDEC will first decode all the internal stream of the decoder, and then insert the user picture after all the decoded picture are output.

1.3.5 Input group

The VDEC module supports simultaneous decoding of multiple stream through time-division multiplexing hardware. For the decoder, each input stream is called a group, and the binary stream from each group can be decoded to output multiple YUV/RGB streams of different resolutions.

1.3.6 Output channel

Each decoded input can be set to have at most two decoded outputs, meaning that one Group can correspond to two Channel outputs. Channel 0 support output crop/scale/RGB/YUV, Channel 1 support output crop/scale/YUV.

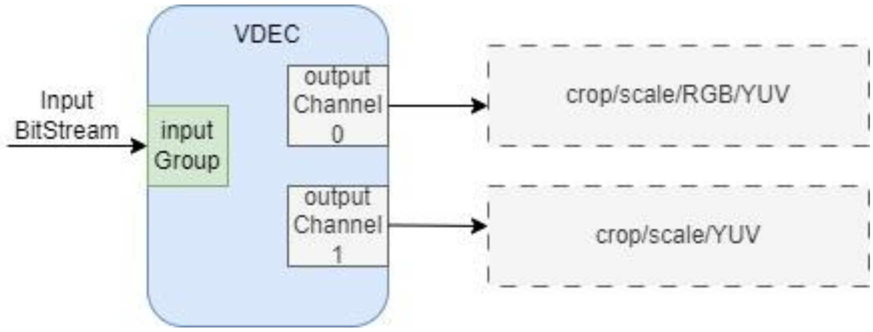

Figure 1-2 Input and output diagram

1.3.7 The allocation method about decoding frame buffer

- ModuleVB pool: When creating a decoding group, image buffer isn't allocated. Instead, the user calls the corresponding ES interface to create a ModuleVB pool dedicated to the decoding module. This VB pool only allows VDEC to obtain VB blocks, and other modules can only use it but cannot obtain it.
- PrivateVB Pool: When creating a decoding group, VDEC creates a private VB pool as the image buffer for the group. User can set the number frameBufCnt of private VB pool, and the size frameBufSize of VB blocks, in the ES_VDEC_CreateGrp group creation interface.
- UserVB Pool: When creating a decoding group, image buffer isn't allocated. Instead, the user calls the interface ES_VB_CreatePool to create a VB pool, and then attaches a decoding group to the VB pool by calling the interface ES_VDEC_AttachVbPool.

The three decoding memory allocation methods can be set through the parameter vdecVBSource in the ES_VDEC_SetModParam. When it using the ModuleVB pool or UserVB pool method, it is possible to directly destroy the VB pool without destroying the decoding group. However, before destroying the VB pool, the user must ensure that no module is using any VB block in this VB pool (this can be achieved by resetting the decoding group and resetting the subsequent modules directly linked to the decoding. For example, if VDEC is linked to VPS, both VDEC and VPS must be reset; if the user obtains images from VDEC, they must also ensure that all images are released back to VDEC), otherwise program exceptions may occur.

2. API Reference

The video decoding module implements functions such as creating decoding groups, sending video streams, and obtaining decoded frames.

The VDEC provides the following APIs:

●ES_VDEC_Init:Initializes VDEC

●ES_VDEC_Deinit:Deinitializes VDEC

●ES_VDEC_SetModParam:Sets the parameters of the VDEC module.

●ES_VDEC_GetModParam:Gets the parameters of the VDEC module.

●ES_VDEC_CreateGrp:Creates a VDEC group.

●ES_VDEC_DestroyGrp:Destroys a VDEC group.

●ES_VDEC_GetGrpAttr: Obtains attributes of a VDEC group.

●ES_VDEC_SetGrpAttr: Sets attributes of a VDEC group.

●ES_VDEC_GetChnMode: Obtains modes of VDEC output channel.

●ES_VDEC_SetChnMode: Sets modes of VDEC output channel.

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- ●ES_VDEC_EnableChn:Enables VDEC output channel.
- ●ES_VDEC_DisableChn:Disables VDEC output channel.
- ●ES_VDEC_StartRecvStream: VDEC starts to receive stream.
- ●ES_VDEC_StopRecvStream: VDEC stops to receive stream.
- ●ES_VDEC_QueryStatus: Queries the status of a VDEC group.
- ●ES_VDEC_GetFd: Obtains the file descriptor of VDEC group.
- ●ES_VDEC_CloseFd:Closes the file descriptor of VDEC group.
- ●ES_VDEC_ResetGrp:Resets the VDEC group.
- ●ES_VDEC_SetGrpParam:Sets parameters of VDEC group.
- ●ES_VDEC_GetGrpParam:Obtains parameters of VDEC groups.
- ●ES_VDEC_SendStream:Sends bit stream for decoding.
- ●ES_VDEC_GetFrame:Obtains decoded frame.
- ●ES_VDEC_ReleaseFrame:Releases a frame buffer.
- ●ES_VDEC_GetUserData:Obtains user data of VDEC group.
- ●ES_VDEC_ReleaseUserData:Releases a user data of VDEC group.
- ●ES_VDEC_SetUserPic:Sets attributes of user picture.
- ●ES_VDEC_EnableUserPic:Enables user picture.
- ●ES_VDEC_DisableUserPic:Disables user picture.
- ●ES_VDEC_SetDisplayMode:Sets the display mode.
- ●ES_VDEC_GetDisplayMode: Obtains the display mode.
- ●ES_VDEC_AttachVbPool: Attaches a VDEC group to a VB pool.
- ●ES_VDEC_DetachVbPool: Detaches a VDEC group to a VB pool.

ES_VDEC_Init

【Function body】

ES_S32 ES_VDEC_Init()

【Description】

Initializes VDEC.

【Parameters】

Parameter Name	Descriptions	Input/Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

This API must be called before all decoding groups are created.

ES_VDEC_Deinit

【Function body】

ES_S32 ES_VDEC_Deinit()

【Description】

Deinitializes VDEC.

【Parameters】

Parameter Name	Descriptions	Input/Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

This API must be called after all decoding groups are destroyed.

ES_VDEC_SetModParam

【Function body】

ES_S32 ES_VDEC_SetModParam(const VDEC_MOD_PARAM_S *pModParam)

【Description】

Sets the parameters of the VDEC module.

【Parameters】

Parameter Name	Descriptions	Input/Output
pModParam	Pointer to the parameters of the decoding module.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

This API must be called before all decoding groups are created. If this API is called after a group is created, the error code ES_ERR_VDEC_NOT_PERM will be returned.

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ES_VDEC_GetModParam

【Function body】

ES_S32 ES_VDEC_GetModParam(VDEC_MOD_PARAM_S *pModParam)

【Description】

Gets the parameters of the VDEC module.

【Parameters】

Parameter Name	Descriptions	Input/Output
pModParam	Pointer to the parameters of the decoding module.	Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

ES_VDEC_CreateGrp

【Function body】

ES_S32 ES_VDEC_CreateGrp(VDEC_GRP vdGrp, DIE_IDX nId, const VDEC_GRP_ATTR_S *pAttr)

【Description】

Creates a VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
nId	Die Id.	Input
VDEC_GRP_ATTR_S	Pointer to VDEC group attributes.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

●The group ID cann't exceed the maximum.

●If pAttr equals ES_NULL, the error code ES_ERR_VDEC_NULL_PTR will be retured.

●The group must be not created(or it is destroyed) before creating the group, otherwise return error code ES_ERR_VDEC_EXIST.

● When the system memory is insufficient, it will return an error code ES_ERR_VDEC_NOMEM. It is possible to consider expanding MMZ memory or OS memory.

● When the value in pAttr exceeds the decoding capability set, the error code ES_ERR_VDEC_ILLEGAL_PARAM will be returned.

●When using the decoding ModuleVB pool, user need to create a module VB pool exclusive to VDEC before creating the decoding group. When using the UserVB pool, It is necessary to create a VB pool for decoding, and the size and number of VB blocks must ensure that is the group requiring. The required number of VB block for decoding each decoding group in H264 and H265 is at least the number of reference frame + the number of display frame + 1, and for decoding each decoding group in JPEG/MJPEG, the required number of VB block is at least the number of display frame + 1. The specific calculation method for decoding the required image VB block size can be found in the function VDEC_GetPicBufferSize of es_buffer.h. The number of reference frame can be found in the functions VDEC_GetH265RefBufferCount and VDEC_GetH264RefBufferCount.

●If the PrivateVB pool is selected, the user needs to configure the required VB size frameBufSize and number frameBufCnt for decoding based on the bit stream.

●The parameters frameBufSize and frameBufCnt are invalid when using MoudleVB and UserVB methods.

●As long as the frame buffer is enough, the decoding group can decode any resolution bit stream within the maximum and minimum resolution range. The width and height of the group are currently only related to the size of the stream buffer.

ES_VDEC_DestroyGrp

【Function body】

ES_S32 ES_VDEC_DestroyGrp(VDEC_GRP vdGrp)

【Description】

Destroys a VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

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●If the group is destroyed before it be created, the error code ES_ERR_VDEC_UNEXIST will be returned.

●The group must stop receiving the stream before it is destroyed (or has not yet begun receiving the stream), otherwise the error code ES_ERR_VDEC_NOT_PERM will be returned.

ES_VDEC_GetGrpAttr

【Function body】

ES_S32 ES_VDEC_GetGrpAttr(VDEC_GRP vdGrp, VDEC_GRP_ATTR_S *pAttr)

【Description】

Obtains attributes of a VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pAttr	Pointer to VDEC group attributes.	Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

●Before obtaining attributes, it is necessary to ensure that the group has been created, otherwise the error ES_ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

ES_VDEC_SetGrpAttr

【Function body】

ES_S32 ES_VDEC_SetGrpAttr(VDEC_GRP vdGrp, const VDEC_GRP_ATTR_S *pAttr)

【Description】

Sets attributes of a VDEC group. Reserved.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pAttr	Pointer to VDEC group attributes.	Input

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【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before setting attributes, it is necessary to ensure that the group has been created, otherwise an error ES_ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- Except for the attributes type, mode, and refFrameNum, other attributes cannot be changed. Among them, type can only switch between H264 and H265, while JPEG and MJPEG can switch between each other.

- Before switching attributes, it is necessary to stop receiving the stream, otherwise the error code ES_ERR_VDEC_NOT_PERM will be returned.

ES_VDEC_GetChnMode

【Function body】

ES_S32 ES_VDEC_GetChnMode(VDEC_GRP vdGrp, VDEC_CHN vdChn, VDEC_CHN_MODE_S *pMode)

【Description】

Obtains modes of VDEC output channel.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input
pMode	Pointer to VDEC output channel parameters.	Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before obtaining parameters, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

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- The channel number is within the maximum channel range, otherwise the error code ES_ERR_VDEC_ILLEGAL_PARAM will be returned.

- The pointer pMode cannot be ES_NULL, otherwise the error code ES_ERR_VDEC_NULL_PTR will be returned.

ES_VDEC_SetChnMode

【Function body】

ES_S32 ES_VDEC_SetChnMode(VDEC_GRP vdGrp, VDEC_CHN vdChn, const VDEC_CHN_MODE_S *pMode)

【Description】

Sets modes of VDEC output channel.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input
pMode	Pointer to VDEC output channel parameters.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before setting parameters, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- The channel number is within the maximum channel range, otherwise the error code ES_ERR_VDEC_ILLEGAL_PARAM will be returned.

- The pointer pMode cannot be ES_NULL, otherwise the error code ES_ERR_VDEC_NULL_PTR will be returned.

ES_VDEC_EnableChn

【Function body】

ES_S32 ES_VDEC_EnableChn(VDEC_GRP vdGrp, VDEC_CHN vdChn)

【Description】

Enables VDEC output channel.

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【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before enabling output channel, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- The channel number is within the maximum channel range, otherwise the error code ES_ERR_VDEC_ILLEGAL_PARAM will be returned.

ES_VDEC_DisableChn

【Function body】

ES_S32 ES_VDEC_DisableChn(VDEC_GRP vdGrp, VDEC_CHN vdChn)

【Description】

Disables VDEC output channel.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before disabling output channel, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- The channel number is within the maximum channel range, otherwise the error code

ES_ERR_VDEC_ILLEGAL_PARAM will be returned.

ES_VDEC_StartRecvStream

【Function body】

ES_S32 ES_VDEC_StartRecvStream(VDEC_GRP vdGrp)

【Description】

VDEC starts to receive stream.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before starting receive bit stream, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- Before starting to receive the stream, it is necessary to ensure that the user picture has been disabled, otherwise the error code ES_ERR_VDEC_NOT_PERM that is not allowed for this operation will be returned.

- Only after starting to receive the stream can ES_VDEC_SendStream be called to successfully send the stream.

- When calling the start receive stream API repeatedly, success is returned.

ES_VDEC_StopRecvStream

【Function body】

ES_S32 ES_VDEC_StopRecvStream(VDEC_GRP vdGrp)

【Description】

VDEC stops to receive stream.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input

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【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before stopping receiving the bit stream, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.
- After stopping receiving the bit stream, calling ES_VDEC_SendStream to send the bit stream will return failure.
- When calling the stop receive stream API repeatedly, success is returned.

ES_VDEC_QueryStatus

【Function body】

ES_S32 ES_VDEC_QueryStatus(VDEC_GRP vdGrp, VDEC_GRP_STATUS_S *pStatus)

【Description】

Queries the status of a VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pStatus	Pointer to VDEC group status.	Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before querying group status, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

ES_VDEC_GetFd

【Function body】

ES_S32 ES_VDEC_GetFd(VDEC_GRP vdGrp, VDEC_CHN vdChn)

【Description】

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Obtains the file descriptor of VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

ES_VDEC_CloseFd

【Function body】

ES_S32 ES_VDEC_CloseFd(VDEC_GRP vdGrp, VDEC_CHN vdChn)

【Description】

Closes the file descriptor of VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

ES_VDEC_ResetGrp

【Function body】

ES_S32 ES_VDEC_ResetGrp(VDEC_GRP vdGrp)

【Description】

Resets the VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before resetting group, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- Before resetting, it is necessary to stop receiving the stream, otherwise the error code ES_ERR_VDEC_NOT_PERM will be returned.

ES_VDEC_SetGrpParam

【Function body】

ES_S32 ES_VDEC_SetGrpParam(VDEC_GRP vdGrp, const VDEC_GRP_PARAM_S *pParam)

【Description】

Sets parameters of VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pParam	Pointer to VDEC group parameters.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before setting parameters, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- If the parameters exceed the legal range, the error code of ES_ERR_VDEC_ILLEGAL_PARAM will be returned. The range of each parameter can be found in the structure VDEC_GRP_PARAM_S.

ES_VDEC_GetGrpParam

【Function body】

ES_S32 ES_VDEC_GetGrpParam(VDEC_GRP vdGrp, VDEC_GRP_PARAM_S *pParam)

【Description】

Obtains parameters of VDEC groups.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pParam	Pointer to VDEC group parameters.	Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before getting parameters, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

ES_VDEC_SendStream

【Function body】

ES_S32 ES_VDEC_SendStream(VDEC_GRP vdGrp, const VDEC_STREAM_S *pStream, ES_S32 milliSec)

【Description】

Sends bit stream for decoding.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pStream	Pointer to stream data.	Input
milliSec	Sending stream flag. Value range: ● -1:block. ● 0:non-block. ● >0:time out，in milliseconds. Dynamic attribute.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

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【Note】

- It is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created. If the group is reset or destroyed when sending bit stream, the error code ES_ERR_VDEC_UNEXIST will be returned.
- This API supports sending bit streams in blocking, non blocking, and timeout modes by changing the milliSec value.
- Before sending data, it is necessary to ensure that the ES_VDEC_StartRecvStream API has been called to start receiving the stream. Otherwise, the error code ES_ERR_VDEC_NOT_PERM will be returned. If the receiving stream stops during the data transmission process, it will immediately return ES_ERR_VDEC_NOT_PERM.
- When sending the bit stream, it is necessary to follow the sending method set when creating the decoding group. When sending by frame, calling this API once, the complete frame stream must be sent, otherwise decoding will result in errors. Sending by Stream does not have this restriction.
- Empty bitstream packets with bEndOfStream 0 cannot be sent (stream length 0 or stream address ES_NULL), otherwise the error code ES_ERR_VDEC_ILLEGAL_PARAM will be returned.
- After sending all the bit streams, an empty stream packet with bEndOfStream 1 can be sent, indicating the end of the current stream file. The decoder will decode all the bit streams and output all the images. In addition, bEndOfStream should be set to 0.
- When the stream buffer is empty and the current packet stream cannot be held, the error code ES_ERR_VDEC_ILLEGAL_PARAM with parameters out of range will be returned.
- When sending the bit stream in frame/compatibility mode, the timestamp of the decoded image is equal to the timestamp in the incoming parameter pStream structure. When sending in stream, the timestamp of the decoded image is equal to 0.
- Sending the bit stream with a non-block manner, and if the bit stream buffer is full, the error code ES_ERR_VDEC_BUF_FULL will be returned.
- Sending the stream in a timeout manner, if the set timeout time is reached and the stream cannot be successfully sent, the error code will be returned ES_ERR_VDEC_BUF_FULL.

ES_VDEC_GetFrame

【Function body】

ES_S32 ES_VDEC_GetFrame(VDEC_GRP vdGrp, VDEC_CHN vdChn, VIDEO_FRAME_INFO_S *pFrameInfo, ES_S32 milliSec)

【Description】

Obtains decoded frame.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input
pFrameInfo	Pointer to decoded frame information.	Output
milliSec	get frame flag. Value range: ● -1:block. ● 0:non-block. ● >0:time out，in milliseconds. Dynamic attribute.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- This API supports block, non-block, and timeout methods to obtain decoded images by changing the milliSec value.

- After obtaining decoded image data through ES_VDEC_GetFrame, it is necessary to release it through ES_VDEC_ReleaseFrame.

- When obtaining the decoded image, it is necessary to ensure that the group has been created, otherwise the error code ES_ERR_VDEC_UNEXIST will be returned. If the group is destroyed during the image acquisition process, the error code ES_ERR_VDEC_UNEXIST will be immediately returned.

- If the group is reset during the process of obtaining the decoded image, the error ES_ERR_VDEC_UNEXIST will be returned.

- Obtaining the decoded image in a non-block manner, and if there is no image in the buffer, immediately return the error code ES_ERR_VDEC_BUF_EMPTY.

- If the decoded image is obtained in a timeout manner, and the image cannot be obtained after the set timeout time, the error code ES_ERR_VDEC_BUF_EMPTY will be returned.

ES_VDEC_ReleaseFrame

【Function body】

ES_S32 ES_VDEC_ReleaseFrame(VDEC_GRP vdGrp, VDEC_CHN vdChn, const VIDEO_FRAME_INFO_S *pFrameInfo)

【Description】

Releases a frame buffer.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input
pFrameInfo	Pointer to decoded frame information.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- This API needs to be paired with ES_VDEC_GetFrame for use, and the obtained data should be released immediately after use. If not released in a timely manner, it may cause the decoding process to block and wait for resources.
- The released data must be the data obtained by ES_VDEC_GetFrame from this channel, and any modifications to the data information structure are not allowed.
- Allowing users to release data without following the order in which they were acquired.
- Releasing the obtained channel data before destroying the channel. If a channel data is obtained and the channel is destroyed and recreated, the driver will fail to release the data because the data node cannot be found.

ES_VDEC_GetUserData

【Function body】

ES_S32 ES_VDEC_GetUserData(VDEC_GRP vdGrp, VDEC_USERDATA_S *pUserData, ES_S32 milliSec)

【Description】

Obtains user data of VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pUserData	Pointer to user data.	Output
milliSec	get data flag. Value range: ● -1:block. ● 0:non-block. ● >0:time out，in milliseconds. Dynamic attribute.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- This API supports block mode, non-block mode, and timeout mode to obtain user data by changing the milliSec value.
- When the user data is encoded in H.264/H.265, a piece of user private data is inserted into the SEI segment of the code stream.
- The JPEG/MJPEG decoding channel does not support obtaining user data.
- When obtaining user data, you must ensure that the channel has been created, otherwise the error code ES_ERR_VDEC_UNEXIST will be returned. If a channel is destroyed while getting user data, the error code ES_ERR_VDEC_UNEXIST is immediately returned.
- If the channel is reset in the process of getting user data, the error code ES_ERR_VDEC_UNEXIST will be returned.
- If the user data is obtained in the timeout mode, and the user data cannot be successfully obtained after the set time is reached, the error code ES_ERR_VDEC_BUF_EMPTY will be returned.
- After the user data is obtained through the ES_VDEC_GetUserData, it needs to be released through the ES_VDEC_ReleaseUserData, and the content of the user data must be the same as that at the time of acquisition.
- If the user data is not obtained in time, the user data will be discarded when the user data buffer is full.

ES_VDEC_ReleaseUserData

【Function body】

ES_S32 ES_VDEC_ReleaseUserData(VDEC_GRP vdGrp, const VDEC_USERDATA_S *pUserData)

【Description】

Releases a user data of VDEC group.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pUserData	Pointer to user data.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- When releasing data, user is necessary to ensure that the group has already been created, otherwise ES_ERR_VDEC_UNEXIST will be returned.
- This API needs to be paired with the ES_VDEC_GetUserData, and the obtained data should be released immediately after use, if it is not released in time, it will cause the user data to be discarded when the buffer is full.
- The released data must be the data obtained from the channel ES_VDEC_GetUserData, and the data information structure must not be modified in any way, and the data obtained from other channels must not be released, otherwise the error code ES_ERR_VDEC_ILLEGAL_PARAM will be returned.
- When releasing data, user must ensure that the channel has been created, otherwise it will be returned to the ES_ERR_VDEC_UNEXIST.

ES_VDEC_SetUserPic

【Function body】

ES_S32 ES_VDEC_SetUserPic(VDEC_GRP vdGrp, VDEC_CHN vdChn, const VIDEO_FRAME_INFO_S *pUsrPic)

【Description】

Sets attributes of user picture.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input
pUsrPic	Pointer to user picture information.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before setting user picture attibutes, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- Before setting the user picture, user must call the API ES_VDEC_DisableUserPic disable the user picture, otherwise the error code ES_ERR_VDEC_NOT_PERM will be returned.

- After the user picture attribute is set successfully, VDEC will keep the user picture VB until the decoding group is destroyed.

- The VB that stores the user picture must be destroyed only after the user guarantees to destroy the decoding group.

- When the user picture attribute is set repeatedly, the decoder will release the previous user picture VB block first, and then occupy the current user picture VB block.

- Different channels can set the properties of the same user picture, or set the properties of different user picture, and the width and height of the user picture are not limited by the width and height of the decoding channel.

- The PTS of the user picture is set to 0.

ES_VDEC_EnableUserPic

【Function body】

ES_S32 ES_VDEC_EnableUserPic(VDEC_GRP vdGrp, VDEC_CHN vdChn, ES_BOOL bInstant)

【Description】

Enables user picture.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input
bInstant	Enable user picture flag. Value range: 0: Enable delayed insertion of user picture. 1: Enable immediate insertion of user picture.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before enabling user picture, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- Before enabling the insertion of user picture, user must set the attributes of user picture first, otherwise the error code ES_ERR_VDEC_NOT_PERM will be returned.

- Before enabling the insertion of user picture, user must stop receiving the bit stream first, otherwise the error code ES_ERR_VDEC_NOT_PERM will be returned.

- After the ES_VDEC_EnableUserPic API is called to enable the insertion of user picture, the API must be called ES_VDEC_DisableUserPic disable the insertion of user picture.

- Repeating the insertion of the user picture returns success, but the user picture will not be inserted again.

- If bInstant is 1, it enables the insertion of user picture immediately, and VDEC will reset the decoding group first, and then insert user picture. Therefore, when a new stream is sent to VDEC after enabling user picture, cannot expect to start decoding correctly immediately, and VDEC must wait for the next I-frame to arrive before it can start decoding correctly. If two output channels are enabled and the user picture is inserted immediately for both output channels, the user picture of the output channel that is enabled first may be overwritten.

- If bInstant is 0, it enables delayed insertion of user picture, so VDEC will wait for the decoder to decode all the streams and output all images before inserting the user picture. If the user picture is disabled before the bit stream is decoded, the user picture will not be inserted after the bit stream is decompressed.

ES_VDEC_DisableUserPic

【Function body】

ES_S32 ES_VDEC_DisableUserPic(VDEC_GRP vdGrp, VDEC_CHN vdChn)

【Description】

Disables user picture.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
vdChn	VDEC output channel ID Value range:[0, ES_VDEC_OUT_CHN_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before disabling user picture, it is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- Repeatedly disabling user picture, success is returned.

ES_VDEC_SetDisplayMode

【Function body】

ES_S32 ES_VDEC_SetDisplayMode(VDEC_GRP vdGrp, VIDEO_DISPLAY_MODE_E displayMode)

【Description】

Sets the display mode.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
displayMode	Display mode.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

● Before setting the display mode, user must ensure that the group has been created, otherwise the error code ES_ERR_VDEC_UNEXIST that the channel has not been created will be returned.

● Preview mode (VIDEO_DISPLAY_MODE_PREVIEW): In preview mode, the adjacent behind module (such as VPS) bound by VDEC receives the decoded frame in a non-blocking mode, that is, when the frame buffer of the VPS is full (the number of decoded frames is more than the number of VPS cache queues), the VPS discards the image sent by VDEC to achieve the purpose of non-block VDEC decoding and realizing real-time preview. It should be noted that when the number of decoded frames is less than the number of VPS cache queues, the VPS will still block decode even if preview mode is enabled.

● Playback mode (VIDEO_DISPLAY_MODE_PLAYBACK): In playback mode, the adjacent behind module (such as VPS) bound by VDEC receives the decoded frame in block mode, that is, when the frame buffer of the VPS is full, it refuses to receive the frame sent by VDEC, and VDEC starts the frame resending mechanism after finding that the current frame fails to be sent, until the frame is sent successfully. In playback mode, the VDEC-bound adjacent behind module can block VDEC decoding to achieve a playback effect without discarding any of the decoded frame.

ES_VDEC_GetDisplayMode

【Function body】

ES_S32 ES_VDEC_GetDisplayMode(VDEC_GRP vdGrp, VIDEO_DISPLAY_MODE_E *pDisplayMode)

【Description】

Obtains the display mode.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
enDisplayMode	Display mode.	Output

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- Before obtaining the display mode, user must ensure that the group has been created, otherwise the error code ES_ERR_VDEC_UNEXIST that the channel has not been created will be returned.

ES_VDEC_AttachVbPool

【Function body】

ES_S32 ES_VDEC_AttachVbPool(VDEC_GRP vdGrp, const VDEC_GRP_POOL_S *pPool)

【Description】

Attaches a VDEC group to a VB pool.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input
pPool	Pointer to VB pool information.	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- It is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- User must call the API ES_MPI_VB_CreatePool to create a VB pool, and then attach the current decoding channel to the VB pool by calling the API ES_VDEC_AttachVbPool. Multiple decoding channels can be attached to the same VB pool, but the same decoding channel can not attach to multiple VB pools.

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- When user want to switch the VB pool attached to the current decoding channel, just call the API ES_VDEC_AttachVbPool again to correctly configure the VB pool.

- If the current decoding memory allocation mode is not based on the UserVB pool, the error code ES_ERR_VDEC_NOT_SURPPORT is returned.

- The picVbPool must be a valid PoolId for the created VB pool, otherwise the error ES_ERR_VDEC_ILLEGAL_PARAM will be returned.

ES_VDEC_DetachVbPool

【Function body】

ES_S32 ES_VDEC_DetachVbPool(VDEC_GRP vdGrp)

【Description】

Detaches a VDEC group to a VB pool.

【Parameters】

Parameter Name	Descriptions	Input/Output
vdGrp	VDEC group ID. Value range:[0,ES_VDEC_MAX_GRP_NUM].	Input

【Return Value】

Return Value	Descriptions
0	Success.
Other values	Failure. Its value is an error code.

【Note】

- It is necessary to ensure that the group has been created, otherwise an error ES-ERR_VDEC_UNEXIST will be returned indicating that the group has not been created.

- If the current decoding memory allocation mode is not based on the UserVB pool, the error code ES_ERR_VDEC_NOT_SURPPORT is returned.

3. Data Structures

VDEC_GRP_POOL_S

Members of data structure		
VB_POOL	picVbPool	VB pool ID.

VDEC_USERDATA_S

Members of data structure		
ES_U64	phyAddr	The physical address of user data.
ES_U32	len	User data length, in byte.
ES_BOOL	bValid	Valid flag. Value range:[0,1]. ● 1:Valid. ● 0:Invalid.
ES_U8*	pAddr	The virtual address of user data.

- When the user data fails to be retrieved, bvalid is equal to 0.
- If the user data is successfully obtained, bvalid is equal to 1.

VIDEO_FRAME_S

Members of data structure		
ES_U32	width	Picture width.
ES_U32	height	Picture height.
VIDEO_FIELD_E	field	Filed mode, reserved.
PIXEL_FORMAT_E	pixelFormat	Pixel format.
DYNAMIC_RANGE_E	dynamicRange	Dynamic range.
COLOR_GAMUT_E	colorGamut	Color gamut.
ES_U32	stride	Frame data stride.
ES_U32	offset	Offset
ES_U64	fd	Buffer fd.
ES_U32	maxLuminance	Max luminance.
ES_U32	minLuminance	Min luminance.
ES_U64	PTS	Picture time stamp.
ES_U64	privateData	Private data.
VIDEO_SUPPLEMENT_S	supplement	Supplement, reserved.

VIDEO_FRAME_INFO_S

Members of data structure		
VIDEO_FRAME_S	stVFrame	Frame information.
ES_U32	poolId	VB pool ID, reserved.
MOD_ID_E	enModId	Frame data from which hardware module.

VDEC_STREAM_S

Members of data structure		
ES_U32	len	Stream packet length, in byte.
ES_U64	PTS	Stream packet time stamp, in byte.
ES_BOOL	bEndOfFrame	End of frame. Only COMPAT mode valid.
ES_BOOL	bEndOfStream	End of stream.
ES_BOOL	bDisplay	Current frame whether

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Members of data structure		
		display. 0:don't display. 1:display.
ES_U8*	pAddr	Stream packet address.

- When sending in frame/compatibility mode, the timestamp of the decoded image is equal to the timestamp in the stream packet.
- When sent by stream, the timestamp of the decoded image is equal to 0.
- When all streams are sent, set bEndOfStream to 1, which means that the stream file ends, and the decoder will decode the streams sent and output all images. If bEndOfStream is set to 0 after all streams are sent, the remaining images of one frame or more in the decoder may not be output.
- VDEC allows user to send an empty stream packet with bEndOfStream 1 (the address is empty or the length is 0).
- The bDisplay flag is invalid when JPEG/MJPEG decodes or sends a stream in stream mode.

VDEC_PARAM_VIDEO_S

Members of data structure		
ES_S32	errThreshold	Error threshold. Value range:[0,100]. 0 represents error or loss, and 100 represents continuing decoding and display regardless of the number of errors. Default:30. Reserved.
VIDEO_DEC_MODE_E	decMode	Decode mode: Default:VIDEO_DEC_MODE_IPB. VIDEO_DEC_MODE_IP mode is currently not supported.
VIDEO_OUTPUT_ORDER_E	outputOrder	Image output order. Default:VIDEO_OUTPUT_ORDER_DISP.

VDEC_GRP_PARAM_S

Members of data structure		
PLYLOAD_TYPE_E	type	Decode protocol.
ES_U32	displayFrameNum	The minimum frame number for external cached images. Value range:[0,16]. Default:2.
VDEC_PARAM_VIDEO_S	vdecVideoParam	Video(H.264/H.265) advance parameters.

- The displayFrameNum can be set to 0 only if the decoded frame is obtained in the user mode or if the VDEC adjacent behind module does not cache any decoded frame, otherwise the decoding may be blocked due to insufficient frame memory.

VDEC_DECODE_ERROR_S

Members of data structure		
ES_S32	formatErr	Unsupported format.
ES_S32	picSizeErrSet	The width(height) of image larger than width(height) of channel.
ES_S32	streamUnsprt	Unsupported specifications
ES_S32	packErr	Bit stream error.
ES_S32	prtclNumErrSet	The number of protocol parameters set is not enough (this parameter only applies to H.264/H.265).
ES_S32	picBufSizeErrSet	The picture buffer memory is insufficient.
ES_S32	vdecStreamNotRelease	Hardware time out.
ES_S32	vdecHardwareErr	Unrecoverable hardware error.
ES_S32	memErrSet	Memory insufficient.

- All error are counted together. For example, every time a bit stream error is found in decoding, the packErrvalue is increased by 1.
- The error count is cleared to zero after resetting the group.

VDEC_GRP_STATUS_S

Members of data structure		
PAYLOAD_TYPE_E	type	Decode protocol.
ES_U32	leftStreamBytes	The number of bytes to be decoded in the stream buffer, the number of undecoded bytes in the current frame being decoded may be inaccurate.
ES_U32	leftStreamFrames	The number of frames to be decoded in the stream buffer, excluding the current frame being decoded. -1 indicates invalid.
ES_U32	leftPics	The number of picture remaining in the output buffer.
ES_U32	leftResendPics	The number of picture waiting to be sent with link mode.
ES_BOOL	bStartRecvStream	Whether decoder start receiving stream.
ES_U32	recvStreamFrames	The number of received stream frames in the stream buffer. -1 indicates invalid.
ES_U32	decodeStreamFrames	The number of frames that have been decoded in the stream buffer.
VDEC_DECODE_ERROR_S	vdecDecErr	VDEC error information.

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VDEC_CHN_MODE_S

Members of data structure		
CROP_INFO_S	cropParam	Crop parameter. Static attribute.
PIXEL_FORMAT_E	pixelFormat	Output format. Static attribute.
ES_U32	alpha	Alpha. Static attribute
COLOR_GAMUT_E	colorGamut	Output color gamut. Static attributes
SCALE_S	scale	Scale parameter. Static attribute.

VDEC_ATTR_VIDEO_S

Members of data structure		
ES_U32	refFrameNum	Reference frame number. Dynamic attribute.

VDEC_GRP_ATTR_S

Members of data structure		
PAYLOAD_TYPE_E	type	Decode protocol. Dynamic attribute. Channel protocols can be switched between H264 and H265, and between JPEG and MJPEG.
VIDEO_MODE_E	mode	Bit stream send mode. Dynamic attribute.
ES_U32	picWidth	Channel maximum width (in pixel). Static attribute. Reserved.
ES_U32	picHeight	Channel maximum height (in pixel). Static attribute. Reserved.
ES_U32	streamBufSize	The size of the stream buffer. Recommended value: A YUV420 decoded image size: width x height x 1.5. Static attribute.
ES_U32	frameBufSize	Frame buffer size. Value range:> 0, However, the user must ensure that the configured frame buffer size meets the buffer requirements of the decoding stream, otherwise the decoding will not be normal. Only PrivateVB mode is valid.
ES_U32	frameBufCnt	Frame buffer count. Value range:>0, However, the user must ensure that the configured number of frames meets the requirements of the

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Members of data structure		
		number of frames stored in the decoding stream, otherwise the decoding will not be normal. The number of frames required for H.264/H.265 decoding is the number of reference frame + the number of display frame + 1. The number of frames required for JPEG/MJPEG decoding is the number of display frame + 1. Only PrivateVB mode is valid. Static attribute.
ES_U32	Align	Output buffer alignment, support 1/8/16/32/64/128/256/512/1024/2048.
VDEC_ATTR_VIDEO_S	vdecVideoAttr	Video(H.264/H.265) decode channel attribute.

VDEC_MOD_PARAM_S

Members of data structure		
VB_SOURCE_E	vdecVBSource	Frame buffer VB source. Value range: VB_SOURCE_MODULE、 VB_SOURCE_PRIVATE、 VB_SOURCE_USER Default:VB_SOURCE_MODULE
ES_U32	miniBufMode	Stream buffer mode. 0: General mode; 1: Memory saving mode. Reserved.

4. Error Code

Error Code	Macro Definition	Description
0xA0036002	ES_ERR_VDEC_INVALID_GRPID	The channel ID is invalid
0xA0036003	ES_ERR_VDEC_ILLEGAL_PARAM	The parameter is invalid.
0xA0036004	ES_ERR_VDEC_EXIST	The device, channel or resource to be created or applied for exists.
0xA0036005	ES_ERR_VDEC_UNEXIST	The device, channel or resource was not created or destroyed.
0xA0036006	ES_ERR_VDEC_NULL_PTR	The parameter pointer is null.
0xA0036007	ES_ERR_VDEC_NOT_CONFIG	No parameter is set before use.
0xA0036008	ES_ERR_VDEC_NOT_SUPPORT	The parameter or function is not supported.
0xA0036009	ES_ERR_VDEC_NOT_PERM	The operation, for example, modifying static parameters, is forbidden.
0xA003600C	ES_ERR_VDEC_NOMEM	The memory fails to be allocated due to

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Error Code	Macro Definition	Description
		some causes such as insufficient system memory.
0xA003600D	ES_ERR_VDEC_NOBUF	The buffer fails to be allocated due to some causes such as oversize of the data buffer applied for.
0xA003600E	ES_ERR_VDEC_BUF_EMPTY	The buffer is empty.
0xA003600F	ES_ERR_VDEC_BUF_FULL	The buffer is full.
0xA0036010	ES_ERR_VDEC_SYS_NOTREADY	The system is not initialized or the corresponding module is not loaded.
0xA0036011	ES_ERR_VDEC_BADADDR	The address error.
0xA0036012	ES_ERR_VDEC_BUSY	The VDEC system is busy.
0xA0036020	ES_ERR_VDEC_FATAL	Unrecoverable error, such as hardware error.

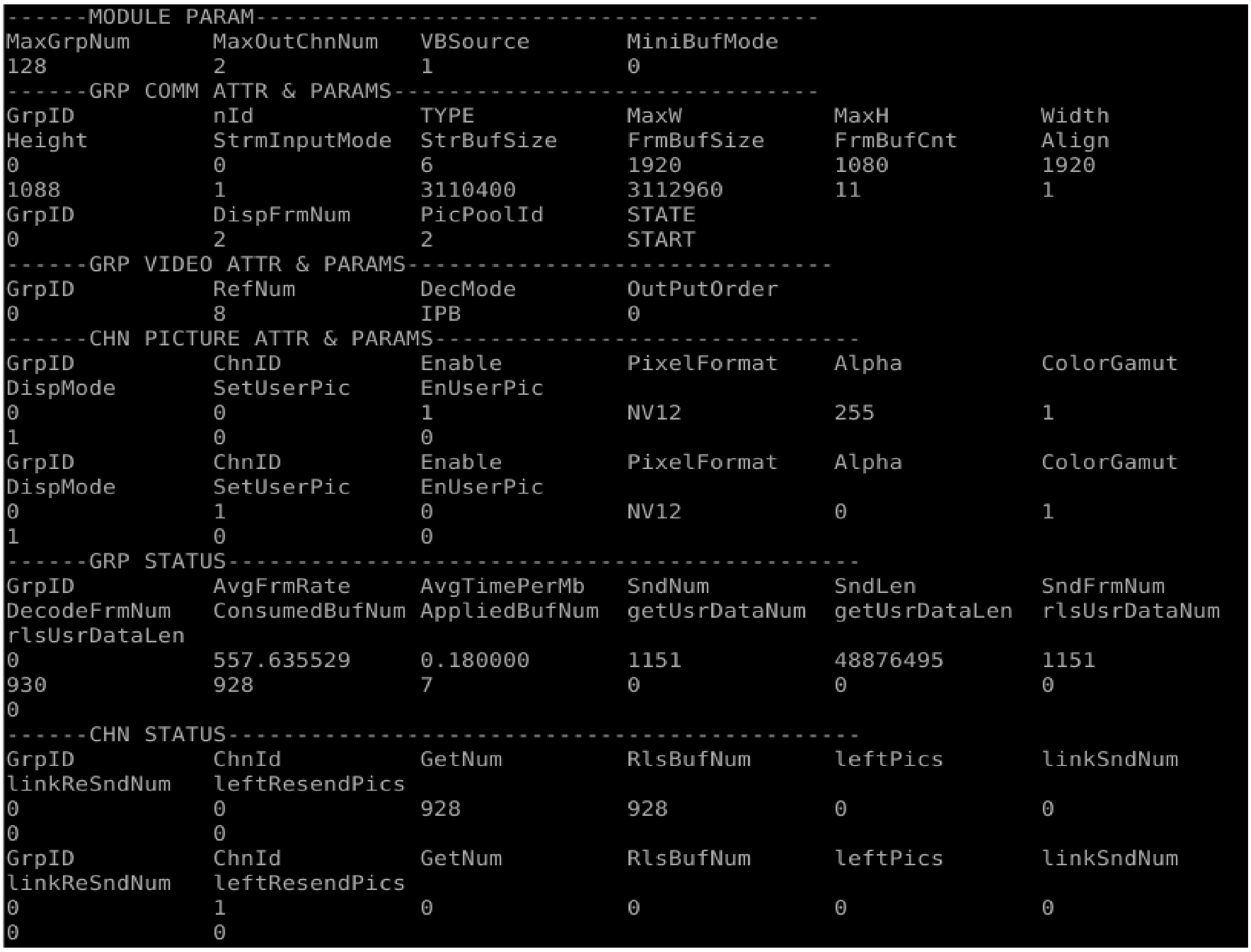
5. Proc Debugging Information

The debugging information is obtained from the proc file system of Linux. The information
reflects the status of the current system and can be used to locate and analyze problems. Use the command cat on the console to view information.

【Dierectory】

/proc/esmap/dec

【Debuging Information】



```
------MODULE PARAM-----------------------------------------
MaxGrpNum      MaxOutChnNum   VBSource       MiniBufMode
128            2              1              0
------GRP COMM ATTR & PARAMS-------------------------------
GrpID          nId            TYPE           MaxW           MaxH           Width
Height         StrmInputMode  StrBufSize     FrmBufSize     FrmBufCnt      Align
0              0              6              1920           1080           1920
1088           1              3110400        3112960        11             1
GrpID          DispFrmNum     PicPoolId      STATE
0              2              2              START
------GRP VIDEO ATTR & PARAMS------------------------------
GrpID          RefNum         DecMode        OutPutOrder
0              8              IPB            0
------CHN PICTURE ATTR & PARAMS----------------------------
GrpID          ChnID          Enable         PixelFormat    Alpha          ColorGamut
DispMode       SetUserPic     EnUserPic
0              0              1              NV12           255            1
1              0              0
GrpID          ChnID          Enable         PixelFormat    Alpha          ColorGamut
DispMode       SetUserPic     EnUserPic
0              1              0              NV12           0              1
1              0              0
------GRP STATUS-------------------------------------------
GrpID          AvgFrmRate     AvgTimePerMb   SndNum         SndLen         SndFrmNum
DecodeFrmNum   ConsumedBufNum AppliedBufNum  getUsrDataNum  getUsrDataLen  rlsUsrDataNum
rlsUsrDataLen
0              557.635529     0.180000       1151           48876495       1151
930            928            7              0              0              0
0

------CHN STATUS-------------------------------------------
GrpID          ChnId          GetNum         RlsBufNum      leftPics       linkSndNum
linkReSndNum   leftResendPics
0              0              928            928            0              0
0              0
GrpID          ChnId          GetNum         RlsBufNum      leftPics       linkSndNum
linkReSndNum   leftResendPics
0              1              0              0              0              0
0              0
```

【Analysis】

Record the applicable status and attribute configuration of the current VDEC group. It can be used to check attribute configuration and current VDEC group statistics status.

【Parameter Description】

Parameter		Description
MODULE PARAM	MaxGrpNum	Maximum number of decoding groups supported by VDEC.
	MaxOutChnNum	Maximum numbers of decoding channels supported by VDEC.

	VBSource	Mode of allocating the VDEC video buffer.
		1:module VB;
		2.private VB;
		3:user VB.

	MiniBufMode	Whether the stream buffer reduction mode is used. 0:unused; 1:used. Reserved.
GRP COMM ATTR & PARAMS	GrpID	VDEC group ID.
	nId	Die ID.

	TYPE	VDEC group type.
		1:PT_JPEG;
		6:PT_H264;
		7:PT_H265;
		8:PT_MJPEG.

	MaxW	Configured maximum width of a decoded image.

Parameter		Description
	MaxH	Configured maximum height of a decoded image.
	Width	Width of a decoded image.
	Height	Height of a decoded image.
	StrmInputMode	Stream transmission mode of the VDEC group. 0:transmit by stream, reserved. 1:transmit by frame. 2:transmit by compat, reserved.
	StrBufSize	Stream buffer size.
	FrmBufSize	Size of frame buffers, valid only in private VB mode.
	FrmBufCnt	Number of frame buffers, valid only in private VB mode.
	Align	Output buffer align.
	DispFrmNum	Number of displayed frames.
	PicPoolId	Reference frame buffer pool ID of VDEC.
	STATE	Whether the VDEC group starts to receive streams. START: The group starts to receive streams. STOP: The group stops receiving streams.
GRP VIDEO ATTR & PARAMS	GrpID	VDEC group ID.
	RefNum	Number of reference frames.
	DecMode	Decoding mode.
	OutPutOrder	Output sequence of a decoding group.
CHN PICTURE ATTR & PARAMS	GrpID	VDEC group ID.
	ChnID	VDEC channel ID.
	Enable	Whether enable output channel.
	PixelFormat	Output format of decoding channel.
	Alpha	Alpha value of output channel in ARGB format.
	ColorGamut	The color gamut when the channel output RGB related formats.
	DispMode	Display mode.
	SetUserPic	Whether set user picture.
	EnUserPic	Whether enable user picture.
GRP STATUS	GrpID	VDEC group ID.
	AvgFrmRate	The average fps of the VDEC group.
	AvgTimePerMb	The average hardware decoding time per macroblock(16x16) of the VDEC group.
	SndNum	Number of sending stream.
	SndLen	Total length of sending stream, in byte.
	SndFrmNum	Frame number of sending stream.
	DecodeFrmNum	Decoded frame number of the VDEC group.
	ConsumedBufNum	The frame buffer number of the VDEC group consumed.
	AppliedBufNum	The output buffer number of the VDEC group registered.
	getUsrDataNum	The number of user obtain user data.
	getUsrDataLen	The total length of user obtain user data, in byte.
	rlsUsrDataNum	The number of user release user data.
	rlsUsrDataLen	The total length of user release user data, in byte.
CHN STATUS	GrpID	VDEC group ID.
	ChnId	VDEC channel ID.
	GetNum	The number of user obtain frame.
	RlsBufNum	The number of user release frame.

Parameter		Description
	leftPics	Left decoded frame number.
	linkSndNum	The successfully sent number to next module in link mode.
	linkReSndNum	The successfully re-sent number to next module in link mode.
	leftResendPics	The left frame number of resend queue in link mode.