NVIDIA CUDA VIDEO ENCODER

SP04456-001_v03 | October 2010

Specification

DOCUMENT CHANGE HISTORY

SP04456-001_v03

Version	Date	Authors	Description of Change
v01	March 31, 2009	RL, TS	Initial Design
v02	May 06, 2009	RL, TS	Updated document for AVC Version 1.1
v03	August 11, 2010	AA, GK, MK, TS	• Added VC-1 Encoder • Updated for offload level, multi GPU, force select GPU, device memory input • Updated for frame rate setting in numerator denominator
v04	October 25, 2010	EY	VC-1 Encoder support has been removed from the Video Encoder library.

TABLE OF CONTENTS

LIST OF TABLES

OVERVIEW

NVIDIA® CUDA Video Encoder is compliant with AVC/H.264 (MPEG-4 Part 10 AVC, ISO/IEC 14496-10). This encoder library is supported on all Tesla GPU and Fermi GPU architecture.

AVC ENCODER

The H.264 encoder receives raw YUV frames and generates NAL packets. The encoder is developed in phases, with incremental tools/features support added at each phase. The final encoder design supports up to High Profile @ Level 4.1.

AVC Version 1.0

Goals

- Main Profile tools / features
- High Profile support
- Production quality encoder

Features

- Baseline/Main/High Profile. Up to Level 4.1
- Support B frames
- Configurable GOP
- HRD compliant for most encoded bit streams[1]

[1] The rate control algorithm implements the HRD model but HRD compliance is not guaranteed for all settings and types of content

Availability:

- Included in NVIDIA GeForce® graphics drivers v181.20 for desktop PCs
- Supported on all CUDA-enabled GPUs with 32 scalar processor cores or more

AVC Version 1.1

Goals:

- High Profile tools / features
- Interlaced encoding

Features:

- High Profile. Up to Level 4.1
- Interlaced encoding (no MBAFF/PicAFF)
- Adaptive 8x8 / 4x4 transform
- CBR rate control

Availability:

- This will be introduced with the R185 graphics drivers in Q2'09
- Supported on all CUDA-enabled GPUs
  (V1.1 also extended the support to CUDA-enabled GPUs with less than 32 cores)

ENCODER FEATURE CHECK LIST

Table 1 lists the supported features for the CUDA Encoder.

Table 1. AVC Encoder Features

Encoder Features	Version 1.0	Version 1.1
CAVLC	Y	Y
CABAC	Y	Y
Deblocking	Y	Y
Profile	Baseline, Main, High	Baseline, Main, High
Level	Up to 4.1	Up to 4.1
IDR Interval	Y	Y
I Interval	Y	Y
B between P	Y	Y
Interlaced	N	Y
Rate Control	CBR/Fixed QP	CBR/VBR/Fixed QP/VBR with Min QP
Max reference frames	1 (Fixed)	1 (Fixed)
ME search range configuration	N	N
Sub-pel refinement	Y	Y
PicAFF	N	N
Adaptive 8x8/4x4	N	Y

ENCODER PRESETS

H.264 encoder Presets

Several encoder presets are provided that target specific requirements of certain encoding targets:

- iPod
- Sony PSP
- Blu-ray
- AVCHD

Encoding parameters are selected and tested on the targeted devices to make sure that encoded bit streams are compatible with the devices.

ENCODER INTERFACES

NVIDIA CUDA Video Encoder exposes API through DirectShow filter interface or a C-library interface. Encoder availabilities for developers:

- Version 1.0 (R180 – Q1 09)
- Version 1.1 (R185 – Q2 09)

DIRECTSHOW

Filter

The NVIDIA CUDA Video encoder DirectShow filter supports GPU accelerated H264 and VC-1 video encoding. Table 2 lists the configuration of the filter interfaces.

Table 2. DirectShow Filter Interface Configuration

Filter Interfaces	IBaseFilter, ISpecifyPropertyPages, INVVESetting
Input pin media type	Supported types: • MediaType: MEDIATYPE_VIDEO • SubType: MEDIASUBTYPE_NULL • Format: FORMAT_VideoInfo, FORMAT_VideoInfo2 The following subtypes are accepted: • MEDIASUBTYPE_YUY2 • MEDIASUBTYPE_IYUV • MEDIASUBTYPE_UYVY • MEDIASUBTYPE_YV12 • MEDIASUBTYPE_NV12
Input Pin Interfaces	IMemInputPin, IPin, IQualityControl
Output pin media type	• MediaType: MEDIATYPE_Video • SubType: MEDIASUBTYPE_H264
Output Pin Interfaces	IPin, IQualityControl
Filter CLSID	See Appendix A. DirectShow Filter GUIDs
Interface ID	See Appendix A. DirectShow Filter GUIDs
Property Page CLSID	Property page not exposed.
Executable	nvcuvenc.dll
Merit	MERIT_DO_NOT_USE

Visibility

The NVIDIA video encoder DirectShow filter visibility is limited. It cannot be used in the **GraphEdit** utility. However, it can be used in a test application using the Filter GUIDs.

INVVESetting Interface

DirectShow Filter **INVVESetting** interface can be used to get capability and set/get the encoder parameters. Table 3 lists the methods used by this interface.

Table3. DirectShow Filter INVVESetting Interface Methods

Methods	Description
IsSupportedCodec	Query if the codec format is supported by the encoder
IsSupportedCodecProfile	Query if the profile for codec format is supported by the encoder
SetCodecType	Set encoder codec format
GetCodecType	Get the current encoding format
IsSupportedParam	Query if the parameter type is supported
SetParamValue	Set the value of the specified parameter type
GetParamValue	Query the current value of the specified parameter type
SetDefaultParam	Applies default settings of the encoding format
GetSPSPPS	Fetches the buffer containing SPS and PPS

IsSupportedCodec

Description:	Query if the codec format is supported by the encoder
Syntax:	HRESULT **IsSupportedCodec**(DWORD dwCodecType)
Parameter:	dwCodecType [in] Codec type support to query
Return Value:	S_OK: The format is supported E_NOINTERFACE: The format is not supported E_FAIL: No CUDA capability present
Remarks:	Only NV_CODEC_TYPE_H264 is supported

IsSupportedCodecProfile

Description:	Query if the profile for codec format is supported by the encoder
Syntax:	HRESULT **IsSupportedCodecProfile** (DWORD dwCodecType, DWORD dwProfileType)
Parameter:	dwCodecType [in] Codec type support to query dwProfileType [in] Codec profile support to query.
Return Value:	S_OK: The profile is supported E_NOINTERFACE: The profile is not supported E_FAIL: No CUDA capability present
Remarks:	For dwCodecType, only NV_CODEC_TYPE_H264 is supported. For dwProfileType, NVVE_H264_PROFILE_BASELINE and NVVE_H264_PROFILE_MAIN are supported for the H.264 codec. NVVE_H264_PROFILE_HIGH support is limited (only at header bits in bitstream)

SetCodecType

Description:	Set encoder codec format
Syntax:	HRESULT **SetCodecType**(DWORD dwCodecType)
Parameter:	dwCodecType [in] Codec format to be set
Return Value:	S_OK: Sucessful E_FAIL: Fail
Remarks:	For dwCodecType, only NV_CODEC_TYPE_H264 is supported. This API must be called before the filter goes to run state, otherwise the graph will not play.

GetCodecType

Description:	Get the current encoding format
Syntax:	HRESULT **GetCodecType**(DWORD *pdwCodecType)
Parameter:	pwdCodecType [out] Pointer to store the current encoding format
Return Value:	S_OK: Successful E_FAIL: The encoding format is not initialized E_POINTER: pwdCodecType is NULL pointer
Remarks:	If successful, *pdwCodecType stores the current encoding format

IsSupportedParam

Description:	Query if the parameter type is supported
Syntax:	HRESULT IsSupportedParam(DWORD dwParamType)
Parameter:	dwParamType [in] Parameter support to query
Return Value:	S_OK: The parameter is supported E_FAIL: The parameter is not supported
Remarks:	Parameter types are listed in Encoder Parameters

SetParamValue

Description:	Set the value of the specified parameter type. The pData points to a memory region storing the value of the parameter. The parameter can be a data structure, which must match the size of the parameter type.
Syntax:	HRESULT SetParamValue(DWORD dwParamType, LPVOID pData)
Parameter:	dwParamType [in] Parameter to set pData [in] This pointer points to memory storing the value(s) of the parameter
Return Value:	S_OK: Successful E_FAIL: Fail to set the value (e.g. encoder state does not allow) E_NOTIMPL: Parameter is not adjustable E_UNEXPECTED: The encoding format is not initialized yet. E_POINTER: pData is NULL pointer
Remarks:	Parameter types are listed in Encoder Parameters

GetParamValue

Description:	Query the current value of the specified parameter type
Syntax:	HRESULT GetParamValue(DWORD dwParamType, LPVOID pData)
Parameter:	dwParamType [in] Parameter to query pData [out] This pointer points to memory to store the value(s) of the parameter
Return Value:	S_OK: Successful E_NOTIMPL: The parameter is not supported E_UNEXPECTED: The encoding format is not initialized. E_POINTER: pData is NULL pointer
Remarks:	If querying is successful, *pData contains the current value of the parameter. Caller should guarantee that pData points to enough memory to store the data structure of the parameter

SetDefaultParam

Description:	Applies default settings of the encoding format
Syntax:	HRESULT SetDefaultParam(void)
Parameter:	-
Return Value:	S_OK: Successful E_UNEXPECTED: The encoding format is not set yet
Remarks:	Default values of parameters are mentioned in *Encoder Parameters* on page 25

GetSPSPPS

Description:	Fetches the buffer containing SPS and PPS
Syntax:	HRESULT GetSPSPPS(unsigned char *pSPSPPSbfr, int nSizeSPSPPSbfr, int *pDatasize)
Parameter:	pSPSPPSbfr [out] Pointer to the buffer for SPS and PPS. Memory for this buffer to be allocated by caller of this API nSizeSPSPPSbfr [in] Size in bytes of the buffer (pSPSPPSbfr) pDatasize [out] Actual size in bytes of the buffer (pSPSPPSbfr)
Return Value:	S_OK: Successful E_UNEXPECTED: The encoder is not initialized E_POINTER: NULL buffer pointer
Remarks:	Encoder should have been initialized prior to calling this API.

C-LIBRARY

API

The NVIDIA CUDA Video Encoder is also exposed as a C-library interface (API) to application. Following sections describe this API and different related structures in depth. Application programmer needs to be aware that the actual encoding APIs of this library have asynchronous operation to facilitate better utilization of CPU and GPU resources. The feedback mechanism to the application is through the callback functions that the application provides to the library at start of operation. See *API Callback* on page 24 section to find more details on callback mechanism.

API Function Interface

Table4. C-library API Functions

Methods	Description
NvGetHWEncodeCaps	Query if the GPU supports the NVIDIA CUDA Video encoder
NVCreateEncoder	Creates the NVIDIA CUDA Video Encoder library object for encoding
NVIsSupportedCodec	Query if the codec format is supported
NVIsSupportedCodecProfile	Query if the codec profile is supported
NVSetCodec	Set the type of compression codec
NVGetCodec	Get the type of compression codec
NVIsSupportedParam	Query if the parameter type is supported
NVSetParamValue	Set the value of the specified parameter type
NVGetParamValue	Get the value of the specified parameter type
NVSetDefaultParam	Applies default settings of the encoding format
NVCreateHWEncoder	Allocate hardware resources for the encoder
NVGetSPSPPS	Fetches the buffer containing SPS and PPS
NVEncodeFrame	Encode one video picture
NVRegisterCB	Register user defined callback functions to the encoder
NVDestroyEncoder	Releases the NVIDIA encoder object

NVGetHWEncodeCaps

Description:	Query if the GPU supports the NVIDIA CUDA Video encoder
Syntax:	HRESULT stdcall NVGetHWEncodeCaps(void)
Parameter:	None
Return Value:	S_OK: CUDA based encoding is supported E_FAIL: No CUDA capability present
Remarks:	None

NVCreateEncoder

Description:	Creates the NVIDIA CUDA Video Encoder library object for encoding.
Syntax:	HRESULT stdcall NVCreateEncoder(NVEncoder *pNVEncoder)
Parameter:	pNVEncoder [out]This will have a valid encoder object handle on successful creation of encoder library instance
Return Value:	S_OK: Success.pNVEncoder parameter will have object handle. E_OUTOFMEMORY : Not enough system memory
Remarks:	The object handle is returned though parameter pNVEncoder. Caller should not allocate any memory but just pass reference to NVEncoder type variable. This API does not commit the actual resources required for encoding.

NVIsSupportedCodec

Description:	Query if the codec format is supported by the encoder
Syntax:	HRESULT stdcall NVIsSupportedCodec(NVEncoder hNVEncoder, DWORD dwCodecType)
Parameter:	hNVEncoder [in] Handle to the encoder instance dwCodecType [in] Codec type support to query
Return Value:	S_OK: The format is supported E_NOINTERFACE: The format is not supported E_FAIL: No CUDA capability present E_POINTER: Encoder handle is invalid
Remarks:	Only NV_CODEC_TYPE_H264 is are supported

NVIsSupportedCodecProfile

Description:	Query if the profile for codec format is supported by the encoder
Syntax:	HRESULT stdcall NVIsSupportedCodecProfile(NVEncoder hNVEncoder, DWORD dwCodecType, DWORD dwProfileType)
Parameter:	hNVEncoder [in] Handle to the encoder instance dwCodecType [in] Codec type support to query dwProfileType [in] Codec profile support to query.
Return Value:	S_OK: The profile is supported E_NOINTERFACE: The profile is not supported E_FAIL: No CUDA capability present E_POINTER : Encoder handle is invalid
Remarks:	For dwCodecType, only NV_CODEC_TYPE_H264 is supported. For dwProfileType, NVVE_H264_PROFILE_BASELINE and NVVE_H264_PROFILE_MAIN are supported. NVVE_H264_PROFILE_HIGH support is limited (only at header bits in bitstream)

NVSetCodec

Description:	Set encoder codec format
Syntax:	HRESULT stdcall NVSetCodec (NVEncoder hNVEncoder, DWORD dwCodecType)
Parameter:	hNVEncoder [in] Handle to the encoder instance dwCodecType [in] Codec format to be set
Return Value:	S_OK: Successful E_NOINTERFACE: Codec format is not supported E_FAIL: No CUDA capability present E_POINTER : Encoder handle is invalid
Remarks:	For dwCodecType, only NV_CODEC_TYPE_H264 is supported.

NVGetCodec

Description:	Get the current encoding format
Syntax:	HRESULT stdcall NVGetCodec (NVEncoder hNVEncoder, DWORD *pdwCodecType)
Parameter:	hNVEncoder [in] Handle to the encoder instance pdwCodecType [out] Pointer to store the current encoding format
Return Value:	S_OK: Successful E_FAIL: The encoding format is not initialized E_POINTER: pdwCodecType is NULL pointer/ encoder handle is invalid
Remarks:	If successful, *pdwCodecType stores the current encoding format

NVIsSupportedParam

Description:	Query if the parameter type is supported
Syntax:	HRESULT stdcall NVIsSupportedParam(NVEncoder hNVEncoder, DWORD dwParamType)
Parameter:	hNVEncoder [in] Handle to the encoder instance dwParamType [in] Parameter support to query
Return Value:	S_OK: The parameter is supported E_FAIL: The parameter is not supported E_POINTER : Encoder handle is invalid
Remarks:	Parameter types are listed in *Encoder Parameters* on page 25

NVSetParamValue

Description:	Set the value of the specified parameter type. The pData points to a memory region storing the value of the parameter. The parameter can be a data structure, which must match the size of the parameter type.
Syntax:	HRESULT stdcall NVSetParamValue(NVEncoder hNVEncoder, DWORD dwParamType, LPVOID pData)
Parameter:	hNVEncoder [in] Handle to the encoder instance dwParamType [in] Parameter to set pData [in] This pointer points to memory storing the value(s) of the parameter
Return Value:	S_OK: Successful E_FAIL: Fail to set the value (e.g. encoder state does not allow) E_NOTIMPL: Parameter is not adjustable E_UNEXPECTED: The encoding format is not initialized yet. E_POINTER: pData is NULL pointer/ encoder handle is invalid
Remarks:	Parameter types are listed in *Encoder Parameters* on page 25

NVGetParamValue

Description:	Query the current value of the specified parameter type
Syntax:	HRESULT stdcall NVGetParamValue(NVEncoder hNVEncoder, DWORD dwParamType, LPVOID pData)
Parameter:	hNVEncoder [in] Handle to the encoder instance dwParamType [in] Parameter to query pData [out] This pointer points to memory to store the value(s) of the parameter
Return Value:	S_OK: Successful E_NOTIMPL: The parameter is not supported E_UNEXPECTED: The encoding format is not initialized. E_POINTER: pData is NULL pointer/ encoder handle is invalid
Remarks:	If querying is successful, *pData contains the current value of the parameter. Caller should guarantee that pData points to enough memory to store the data structure of the parameter

NVSetDefaultParam

Description:	Applies default settings of the encoding format
Syntax:	HRESULT stdcall NVSetDefaultParam(NVEncoder hNVEncoder)
Parameter:	hNVEncoder [in] Handle to the encoder instance
Return Value:	S_OK: Successful E_UNEXPECTED: The encoding format is not set yet E_POINTER : Encoder handle is invalid
Remarks:	Default values of parameters are mentioned in *Encoder Parameters* on page 25

NVCreateHWEncoder

Description:	Allocate hardware resources for the encoder
Syntax:	HRESULT stdcall NVCreateHWEncoder(NVEncoder hNVEncoder)
Parameter:	hNVEncoder [in] Handle to the encoder instance
Return Value:	S_OK: Successful E_FAIL : Failed to allocate all hardware resources for NVIDIA CUDA video encoder E_POINTER : Encoder handle is invalid
Remarks:	None

NVGetSPSPPS

Description:	Fetches the buffer containing SPS and PPS
Syntax:	HRESULT stdcall NVGetSPSPPS(NVEncoder hNVEncoder ,unsigned char *pSPSPPSbfr, int nSizeSPSPPSbfr, int *pDatasize)
Parameter:	hNVEncoder [in] Handle to the encoder instance pSPSPPSbfr [out] Pointer to the buffer for SPS and PPS. Memory for this buffer to be allocated by caller of this API nSizeSPSPPSbfr [in] Size in bytes of the buffer (pSPSPPSbfr) pDatasize [out] Actual size in bytes of the buffer (pSPSPPSbfr)
Return Value:	S_OK: Successful E_UNEXPECTED: The encoder is not initialized E_POINTER: NULL buffer pointer/encoder handle is invalid
Remarks:	Encoder should have been initialized prior to calling this API.

NVEncodeFrame

Description:	Encode one video picture
Syntax:	HRESULT stdcall NVEncodeFrame(NVEncoder hNVEncoder, NVVE_EncodeFrameParams *pFrmIn, DWORD flag, void *pData)
Parameter:	hNVEncoder [in] Handle to the encoder instance pFrmIn [in]Various params for encoding the frame. See NVVE_EncodeFrameParams structure flag [in] (H.264 only) Contain the instruction for the encoding operations. The value of flag presently could be anyone of: FORCE_IDR = 0x04 (to force an IDR), FORCE_INTRA (to force an intra frame), INSERT_SPS (to insert sps), INSERT_PPS (to insert PPS). Note: Currently only FORCE_IDR is supported. pData [in] Pointer to data structure associated with the control instruction flag (if any required) or pointer to device memory input frame (CUdeviceptr type casted to void*) in case of NVVE_DEVICE_MEMORY_INPUT. When using NVVE_DEVICE_MEMORY_INPUT the picBuf element in the structure must be set to NULL pFrmIn.picBuf = NULL;
Return Value:	S_OK: Successful E_FAIL: Encoding has failed E_POINTER: Encoder handle is invalid
Remarks:	NVVE_EncodeFrameParams contains the information about the incoming source pictures. Caller can control the encoding operation through flag and pData parameters.

NVRegisterCB

Description:	Register user defined callback functions to the encoder
Syntax:	void stdcall NVRegisterCB(NVEncoder hNVEncoder, NVVE_CallbackParams cb, void *pUserdata)
Parameter:	hNVEncoder [in] Handle to the encoder instance cb [in]Structure containing the function pointers to a callback pUserdata [in] A void pointer which will be stored and passed back in the callbacks
Return Value:	None
Remarks:	The callback functions are called by the encoder to indicate the start of encoding a frame, end of encoding a frame, get output bitstream buffers and release output bitstream buffer. Also the encoder will receive and store a void *pUserdata which it will pass back in the callback functions

NVDestroyEncoder

Description:	Releases the NVIDIA CUDA Video Encoder library object
Syntax:	HRESULT stdcall NVDestroyEncoder(NVEncoder hNVEncoder)
Parameter:	hNVEncoder [in] Handle to the encoder instance
Return Value:	S_OK: Successful E_POINTER Encoder handle is invalid
Remarks:	None

API Usage

This section provides an overview of the API usage in a typical encoding scenario.

A typical encoding session works as follows:

- The application queries whether the GPU supports the NVIDIA CUDA Video Encoder using ***NVGetHWEncodeCaps()***.
- If the GPU supports the NVIDIA CUDA Video Encoder, the application sets up an encoding session by creating an encoder object using ***NVCreateEncoder()***.
- The application queries what codecs are supported using ***NVIsSupportedCodec()***.The application may further query to know if a particular profile for this codec is supported using ***NVISSupportedCodecProfile()***.
- The application sets the desired codec using ***NVSetCodec()***.
- The application may now want to set the different encoding parameters using ***NVSetParamValue()*** or it might choose to accept the default parameter settings using ***NVSetDefaultParam()***.Default values for all parameters are described in sections below.
- If the application wants to query the parameters or encoding type, it can be done using ***NVGetParamValue()*** and ***NVGetCodec()***.
- The application should register the callback handlers using ***NVRegisterCB()***. The application may pass a userdata pointer here for later use. This can be called after ***NVCreateEncoder()*** and needs to be called before calling ***NVEncodeFrame()***.
- The application allocates/commits hardware resources (for the codec type set earlier) using ***NVCreateHWEncoder()***.
- To initiate encoding of a single frame the application calls ***NVEncodeFrame()***.

- The callbacks work as follows:
  - On beginning the encode of a picture a callback to OnBeginFrame will be received.
  - The application needs to allocate memory for writing the encoded bitstream and pass it in AcquireBitstream.
  - The pointer to the encoded bitstream along with its size in bytes will be passed back in ReleaseBitstream. The application can use this pointer to store the encoded bitstream.
  - After the encoding for a picture is complete OnEndFrame will be called.
  - For detailed description of this mechanism please refer section on Callback.
- For the last picture to be encoded the application should set the bLast field of NVVE_EncodeFrameParams to true while calling ***NVEncodeFrame()***.
- After encoding is complete the application should release the encoder object by calling ***NVDestroyEncoder()***.

Pseudo code based on above description:

```
Main ()
{
      NVGetHWEncodeCaps() // checks CUDA encoding capabilities
      NVCreateEncoder()  // creates the encoder object
      NVSetCodec()   // set the codec type
      NVSetDefaultParam()//setup the default parameters
      //allocate callback function pointers
      // and any other resources that may be required
      NVRegisterCB()     // setup callbacks
      NVCreateHWEncoder() // allocate CUDA resources
      while (frames) {
            NVEncodeFrame()
             …
      }
      NVDestroyEncoder() // destroys the encoder object
      //clean up all the resources before quitting
}

//Callbacks
AcquireBitstream(int *pBufferSize, void *pUserdata)
{
      //specify size in *pBufferSize
      //return bitstream buffer;
}
ReleaseBitstream(int nBytesInBuffer, unsigned char *cb,void *pUserdata)
{
    //encoded bitstream for the current picture is returned in the
    //buffer cb points to
}
```

API Callback

Caller applications implement callback functions and register to the encoder using ***NVRegisterCB( )*** function. These callback functions are used to acquire/release input frames and bitstream buffers. The application should be sending a void *pUserdata while calling ***NVRegisterCB( )*** to which will be stored in the encoder dll and later on passed back on through the callback functions.

The callback order received will be in the following order:
OnBeginFrame→AcquireBitstream→ ReleaseBitstream→OnEndFrame.

Alternatively, the caller can choose not to use the **OnBeginFrame** and **OnEndFrame** function pointers. If they set these two function pointers to NULL then only the callbacks to **AcquireBitstream** and **ReleaseBitstream** will be received.

The application allocate sa buffer to store the coded bitstream and pass it on to **AcquireBitstream**. **pBufferSize** points to the size of the buffer allocated. If the buffer allocated is not sufficient in size to contain the entire picture, **AcquireBitstream** and **ReleaseBitstream** are called multiple times.

The pointer to the buffer acquired in **AcquireBitstream** is stored and passed back on a **ReleaseBitstream** callback to the application as the 2nd argument to **ReleaseBitstream** (an unsigned char *).

The NVVE_BeginFrameInfo and NVVE_EndFrameInfo structures have two members each:

- **nFrameNumber**: zero-based frame number in display order (same for both fields of a frame)
- **nPicType:** this signifies the encoded picture type. It will take one of the values of NVVE_PIC_TYPE_IFRAME, NVVE_PIC_TYPE_PFRAME and NVVE_PIC_TYPE_BFRAME.

ENCODER PARAMETERS

The encoder parameters can be configured using the DirectShow Filter INVVESetting interface or C -library API parameter configuration methods.

Table 5 lists encoder setup parameters.

Table5. Encoder Setup Parameters

Parameter	Description	Type	Range	Default
NVVE_OUT_SIZE	Specify the targeted encoding frame size. (use {0,0} for same size as detected at input)	INT[2]	Depends on profile level	{0,0}
NVVE_IN_SIZE	Specify the input picture dimension. (INT[0]:Width, INT[1]:Height)	For Dshow: NA (Query Parameter)	NA	NA
		For C-lib: INT[2]	+ve integer	{0,0}
NVVE_ASPECT_RATIO	Specify the display aspect ratio. Encoder does not perform aspect ratio conversion. This should match the display aspect ratio of the input.	For Dshow: **FLOAT** (if not custom) **NVVE_AspectRatio Params*** (if custom) To specify width, height, type **(DAR/SAR)**	For Dshow: 4.0f/3.0f, 16.0f/9.0f, 1.0f, custom	For Dshow: 4.0f/3.0f
		For C-lib: INT[3] {width, height, aspect_ ratio_type} Aspect_ratio_ type is of the type enum **NVVE_ASPECT_ RATIO_TYPE (DAR/SAR)***	For C-lib: Array members should be integers >=0 For SAR, width and height values should be unsigned 16 bit integers as per ISO 14496- 10	For C-lib: {4, 3, 0}, correspondin g to 4:3 **DAR**.

Parameter	Description	Type	Range	Default
NVVE_FIELD _ENC_MODE	Specify if the frame or field encoding mode is used (H.264 only).	**NVVE_FIELD _MODE***	**MODE_FRAME, MODE_TOP_FIELD_ FIRST, MODE_BOTTOM_FIELD _FIRST**	MODE _FRAME
NVVE_P_INTERVAL	This sets the distance of one P picture from the previous P picture. e.g. for **IBBPBBP**, set the value as 3 (H.264 only).	**INT**	1-17	1
NVVE_IDR_PERIOD	This is the IDR period for H264.	**INT**	+ve integer >= 1	15
NVVE_DYNAMIC _GOP	The GOP structure is determined dynamically by the encoder (H.264 only). (does not take effect in V1.0)	**INT**	0: disable 1: enable	0
NVVE_RC_TYPE	The rate control type.	**NVVE_RC _TYPE***	For H.264: **RC_CQP, RC_VBR, RC_CBR, RC_VBR_MINQP** **For VC-1** **RC_CBR**	**RC_VBR** (H.264) **RC_CBR (VC-1)**
NVVE_AVG _BITRATE	The average bit rate in bps is the target bit rate used for VBR rate control.	**INT**	+ve integer	6000000
NVVE_PEAK _BITRATE	The maximum bit rate in bps is the peak bit rate used for VBR rate control.	**INT**	+ve integer	6200000
NVVE_QP_LEVEL _INTER_P	The QP level for inter P pictures. [Note: The QP will be clipped by the encoder if it exceeds the supported QP range] For **RC_VBR_MINQP** rate control mode this parameter to be interpreted as min QP for inter P pictures (H.264 only).	**INT**	+ve integer (0: default)	28
NVVE_QP_LEVEL _INTER_B	The QP level for inter B pictures. [Note: The QP will be clipped by the encoder if it exceeds the supported QP range] For **RC_VBR_MINQP** rate control mode this parameter to be interpreted as min QP for inter B pictures (H.264 only).	**INT**	+ve integer (0: default)	28
NVVE_QP_LEVEL _INTRA	The QP level for intra pictures. [Note: The QP will be clipped by the encoder if it exceeds the supported QP range] For **RC_VBR_MINQP** rate control mode this parameter to be interpreted as min QP for intra pictures (H.264 only).	**INT**	+ve integer (0: default)	28

Parameter	Description	Type	Range	Default
NVVE_FRAME_RATE	Output frame rate (should be same as input frame rate). No frame rate conversion is performed if the output frame rate is not the same as the input frame rate.	For DShow: NVVEFrame Rate* If **NVVE_FRAME_RATE_NUMDEN**, then specify using **NVVE_FrameRate Descriptor***	For DShow: as per enum If **NVVE_FRAME_RATE_NUMDEN**, then Numerator >=0 Denominator >0	For DShow: 29.97
		For C-Iib: INT[2] {numerator, denominator}	For C-Iib: Numerator >=0 Denominator >0	For C-Iib: {30000, 1001}
NVVE_DEBLOCK_MODE	Enable or disable de-blocking mode. This is only valid for H.264 (H.264 only).	INT	0: disable 1: enable	1
NVVE_PROFILE_LEVEL	Set the profile and level information. Level Setting: Other encoding parameters should be conformant to the level to avoid later failure at initialization.	INT	For H.264 Byte 0: 0x42:Baseline 0x4d:Main 0x64:High Byte 1: 0xff:auto select level. 10(0x0a), 11(0x0b), 12(0x0c), 13(0x0d), 20(0x14), 21(0x15), 22(0x16), 30(0x1e), 31(0x1f), 32(0x20), 40(0x28), 41(0x29), 42(0x2a), 50(0x32), 51(0x33): For Level 1.0, 1.1, 1.2, 1.3, 2.0, 2.1, 2.2, 3.0, 3.1, 3.2, 4.0, 4.1, 4.2, 5.0, 5.1 Byte2,3: reserved	0xff42
NVVE_FORCE_INTRA	Force generation of an intra frame (H.264 only).	**INT**	1	NA
NVVE_FORCE_IDR	Force generation of an IDR (H.264 only).	**INT**	1	NA
NVVE_CLEAR_STAT	Clear the statistics values (H.264 only).	**INT**	1	NA
NVVE_SET_DEINTERLACE	Set the deinterlace algorithm (H.264 only).	**NVVE_DI_MODE***	**DI_OFF, DI_MEDIAN**	**DI_MEDIAN**
NVVE_PRESETS	Set the encoding parameters according to the presets required for supported encoding targets (H.264 only).	**NVVE_PRESETS_TARGET***	**PSP, iPOD, AVCHD, BD, HDV_1440**	NA
NVVE_DISABLE_CABAC	Enable or disable **CABAC** (H.264 only).	**INT**	0: enable 1: disable	0

Parameter	Description	Type	Range	Default
NVVE_CONFIGURE_NALU_FRAMING_TYPE	Configures the NAL unit framing type (H.264 only).	**INT**	0: start codes 1, 2, 4: length prefixed NAL units of size 1, 2, or 4 bytes	0
NVVE_DISABLE_SPS_PPS	Enable or disable including sequence parameter set/picture parameter set (**SPS/PPS**) information in bitstream (H.264 only).	**INT**	0: enable 1: disable	0
NVVE_SLICE_COUNT	Sets the number of slices per picture. Setting this to non-zero value will set the slice number per picture. If it is set to zero, the encoder will use its own default settings (H.264 only). Recommended settings for different output resolutions: <= 400x256 : 1 >= 400x256 and < 640x480 : 2 > 640x480 : 4	**INT**	>=0	0 (decided by encoder)
NVVE_GPU_OFFLOAD_LEVEL	Sets the GPU offload level. Applicable only to select GPUs and Codec	**NVVE_GPUOffloadLevel**	Default, Estimators, All	Default
NVVE_MULTI_GPU	consider multi GPU usage if found suitable for the platform and codec	**INT**	1: consider 0: don't consider	1:consider
NVVE_FORCE_GPU_SELECTION	Force encoding on a particular GPU in the system	**INT**	-1 : default n : GPU ordinal number	-1 : default
NVVE_DEVICE_MEMORY_INPUT	Input frame is provided to encoder in device memory For Dshow: The input frame CUDA device memory pointer (CUdeviceptr) should be passed in the data pointer (type casted) of the input sample to the filter. For Clib: The input frame CUDA device memory pointer (CUdeviceptr) should be passed in the pData pointer (type casted) of the NVEncodeFrame() API. In this case the buffer pointer in NVVE_EncodeFrameParams is ignored	INT	0 : system memory input 1: device memory input	0: system memory input
NVVE_DEVICE_CTX_LOCK	Provide video context lock for device memory input.	**CUvideoctxlock**	Handle to be obtained from **NVCUVID APIs**	NA

Note: * For datatypes, see *Appendix B. INVVESETTING INTERFACE/C-LIBRARY API DATATYPES* on page 32.

ENCODER QUERY PARAMETERS

Table 6 lists the encoder query parameters.

Table 6. Encoder Query Parameters

Parameter	Description	Type
NVVE_IN_SIZE	Get the input picture dimension. (INT[0]:Width, INT[1]:Height)	INT[2]
NVVE_STAT_NUM_CODED_FRAMES	Get the number of encoded frames so far.	LONGLONG
NVVE_STAT_NUM_RECEIVED_FRAMES	Get the number of received frames from input pin.	LONGLONG
NVVE_STAT_BITRATE	Get generated average bit rate in bps.	INT
NVVE_STAT_NUM_BITS_GENERATED	Number of bits generated.	LONGLONG
NVVE_GET_PTS_DIFF_TIME	Get the PTS difference between the last received sample and the current output PTS.	LONGLONG
NVVE_GET_PTS_CODED_TIME	Get the encoded PTS of the current frame.	LONGLONG
NVVE_GET_PTS_RECEIVED_TIME	Get the received PTS of the current frame.	LONGLONG
NVVE_STAT_ELAPSED_TIME	Get the elapsed time from the first received sample to the last received sample (in unit of 10000 ms).	LONGLONG
NVVE_STAT_QBUF_FULLNESS	Get the number of samples queued at the input.	INT
NVVE_STAT_PERF_FPS	Get the runtime average of encoded frames per second. (considers only the time taken to start coding a frame and end coding a frame).	FLOAT
NVVE_STAT_PERF_AVG_TIME	Get the average encoding time per frame (unit of 10 ms) (considers only the time taken to start coding a frame and end coding a frame).	DWORD
NVVE_GPU_OFFLOAD_LEVEL_MAX	Query maximum supported offload level for platform	NVVE_GPUOffloadLevel
NVVE_GET_GPU_COUNT	Get count of capable GPUs	INT
NVVE_GET_GPU_ATTRIBUTES	Get attributes of a particular GPU in the system. (provide GPU ordinal number)	NVVE_GPUAttributes

ENCODER PARAMETER DEPENDENCY

NVVE_RC_TYPE:

- For RC_VBR, the parameters NVVE_AVG_BITRATE and NVVE_PEAK_BITRATE take effect.
- For RC_CQP, the parameters NVVE_QP_LEVEL_INTER_P, NVVE_QP_LEVEL_INTER_B and NVVE_QP_LEVEL_INTRA take effect.
- For RC_CBR, the parameter NVVE_AVG_BITRATE takes effect.
- For RC_VBR_MINQP, the parameters NVVE_AVG_BITRATE, NVVE_PEAK_BITRATE, NVVE_QP_LEVEL_INTER_P, NVVE_QP_LEVEL_INTER_B and NVVE_QP_LEVEL_INTRA take effect. In this mode, since the encoder is limiting the min value of QP, the resulting bitrate can be lower – and potentially significantly lower – than the average bitrate.

NVVE_CLEAR_STAT:

Resets the statistic values for following parameters (mentioned in *Encoder Query Parameters* on page 29:

- NVVE_STAT_NUM_CODED_FRAMES, NVVE_STAT_NUM_RECEIVED_FRAMES,
- NVVE_STAT_BITRATE, NVVE_STAT_NUM_BITS_GENERATED,
- NVVE_GET_PTS_DIFF_TIME, NVVE_GET_PTS_CODED_TIME,
- NVVE_GET_PTS_RECEIVED_TIME, NVVE_STAT_ELAPSED_TIME,
- NVVE_STAT_QBUF_FULLNESS, NVVE_STAT_PERF_FPS,
- NVVE_STAT_PERF_AVG_TIME.

NVVE_OUT_SIZE/NVVE_IN_SIZE:

For DirectShow Filter, NVVE_IN_SIZE will return the dimensions based on the pin connection at the input pin. For C-lib API, NVVE_IN_SIZE will set the input dimensions for the encoder. NVVE_OUT_SIZE is used to specify the targeted encoded output dimensions.

NVVE_DEVICE_MEMORY_INPUT / NVVE_DEVICE_CTX_LOCK:

Device Context Lock parameter must also be set if device memory input is enabled. Context lock should be created from cuvidCtxLockCreate API available in NVCUVID.

APPENDIX A. DIRECTSHOW FILTER GUIDS

DIRECTSHOW FILTER GUID

```
// {B63E31D0-87B5-477f-B224-4A35B6BECED6} 'Dshow NVIDIA Video Encoder
// Filter'
DEFINE_GUID(CLSID_NVIDIA_VideoEncoderFilter,
0xb63e31d0, 0x87b5, 0x477f, 0xb2, 0x24, 0x4a, 0x35, 0xb6, 0xbe, 0xce,
0xd6);
```

DIRECTSHOW FILTER INVVESETTING INTERFACE GUID

```
// {4597F768-F60-4E5B-B697-67EB2614DCB5} 'INVVESetting interface'
DEFINE_GUID(IID_INVVESetting,
0x4597f768, 0xf60, 0x4e5b, 0xb6, 0x97, 0x67, 0xeb, 0x26, 0x14, 0xdc,
0xb5);
```

APPENDIX B. INVVESETTING INTERFACE/C-LIBRARY API DATATYPES

```
//
// Datatypes for DirectShow Filter INVVESetting Interface/C-library API
to the video encoder
//

// Codec Type
// Used in IsSupportedCodec, IsSupportedCodecProfile, SetCodecType,
// GetCodecType interface functions
#define NV_CODEC_TYPE_MPEG1                    1 //not supported
#define NV_CODEC_TYPE_MPEG2                    2 //not supported
#define NV_CODEC_TYPE_MPEG4                    3 //not supported
[illegible]

// Codec Profile Type
// Used in IsSupportedCodecProfile interface functions
#define NVVE_MPEG2_PROFILE_MAIN                0 //not supported
#define NVVE_H264_PROFILE_BASELINE             1
#define NVVE_H264_PROFILE_MAIN                 2
#define NVVE_H264_PROFILE_HIGH                 3

// Coded Picture Type                          //C-lib only
// Used in NVVE_BeginFrameInfo, NVVE_EndFrameInfo
[illegible]
[illegible]
[illegible]

// Encoding Parameters
// Used in SetParamValue, GetParamValue interface functions
enum EncodeParams
{
    NVVE_OUT_SIZE = 1,
```

```
    NVVE_ASPECT_RATIO,
    NVVE_FIELD_ENC_MODE,
    NVVE_P_INTERVAL,
    NVVE_IDR_PERIOD,
    NVVE_DYNAMIC_GOP,
    NVVE_RC_TYPE,
    NVVE_AVG_BITRATE,
    NVVE_PEAK_BITRATE,
    NVVE_QP_LEVEL_INTRA,
    NVVE_QP_LEVEL_INTER_P,
    NVVE_QP_LEVEL_INTER_B,
    NVVE_FRAME_RATE,
    NVVE_DEBLOCK_MODE,
    NVVE_PROFILE_LEVEL,
    NVVE_FORCE_INTRA,                //DShow only
    NVVE_FORCE_IDR,                  //DShow only
    NVVE_CLEAR_STAT,                 //DShow only
    NVVE_SET_DEINTERLACE,
    NVVE_PRESETS,
    NVVE_ IN_SIZE,
    NVVE_STAT_NUM_CODED_FRAMES,    //DShow   only
    NVVE_STAT_NUM_RECEIVED_FRAMES,  //DShow  only
    NVVE_STAT_BITRATE,         //DShow        only
    NVVE_STAT_NUM_BITS_GENERATED,   //DShow  only
    NVVE_GET_PTS_DIFF_TIME,          //DShow only
    NVVE_GET_PTS_BASE_TIME,          //DShow only
    NVVE_GET_PTS_CODED_TIME,      //DShow     only
    NVVE_GET_PTS_RECEIVED_TIME,    //DShow   only
    NVVE_STAT_ELAPSED_TIME,          //DShow only
    NVVE_STAT_QBUF_FULLNESS,         //DShow only
    NVVE_STAT_PERF_FPS,              //DShow only
    NVVE_STAT_PERF_AVG_TIME,         //DShow only
    NVVE_DISABLE_CABAC,
    NVVE_CONFIGURE_NALU_FRAMING_TYPE,
    NVVE_DISABLE_SPS_PPS,
    NVVE_SLICE_COUNT,
    NVVE_GPU_OFFLOAD_LEVEL,
    NVVE_GPU_OFFLOAD_LEVEL_MAX,
    NVVE_MULTI_GPU,
    NVVE_GET_GPU_COUNT,
    NVVE_GET_GPU_ATTRIBUTES,
    NVVE_FORCE_GPU_SELECTION,
    NVVE_DEVICE_MEMORY_INPUT,
    NVVE_DEVICE_CTX_LOCK
};

// Rate Control Method
// Used for NVVE_RC_TYPE in SetParamValue, GetParamValue interface
// functions
enum RC_TYPE
{
    RC_CQP = 0,
```

```
    RC_VBR,
    RC_CBR,
    RC_VBR_MINQP
};

// Frame Rate
// Used for NVVE_FRAME_RATE in SetParamValue, GetParamValue interface
// functions
enum NVVEFrameRate
{
    NVVE_FRAME_RATE_12 = 0,
    NVVE_FRAME_RATE_12_5,
    NVVE_FRAME_RATE_14_98,
    NVVE_FRAME_RATE_15,
    NVVE_FRAME_RATE_23_97,
    NVVE_FRAME_RATE_24,
    NVVE_FRAME_RATE_25,
    NVVE_FRAME_RATE_29_97,
    NVVE_FRAME_RATE_30,
    NVVE_FRAME_RATE_50,
    NVVE_FRAME_RATE_59_94,
    NVVE_FRAME_RATE_60,
    NVVE_FRAME_RATE_NUMDEN,
    NVVE_NUM_FRAME_RATES,
    NVVE_FRAME_RATE_UNKNOWN    // Unknown/unspecified frame rate (or
variable)
};

// Frame rate descriptor
// Used for NVVE_FRAME_RATE in SetParamValue, GetParamValue
// interface functions
typedef struct _NVVE_FrameRateDescriptor
{
    NVVE_FrameRate eFrameRate;
    int lNumerator;
    int lDenominator;
} NVVE_FrameRateDescriptor;

// Field Encoding mode
// Used for NVVE_FIELD_ENC_MODE in SetParamValue, GetParamValue
// interface functions
enum NVVE_FIELD_MODE
{
    MODE_FRAME = 0,
    MODE_FIELD_TOP_FIRST,
    MODE_FIELD_BOTTOM_FIRST,
    MODE_FIELD_PICAFF,                  //not supported
};

// Deinterlacing algorithm
// Used for NVVE_SET_DEINTERLACE in SetParamValue, GetParamValue
// interface functions
```

```
enum NVVE_DI_MODE
{
    DI_OFF,
    DI_MEDIAN,
};

// Encoding Presets
// Used for NVVE_PRESETS in SetParamValue, GetParamValue
// interface functions
enum NVVE_PRESETS_TARGET
{
    ENC_PRESET_PSP,
    ENC_PRESET_IPOD,
    ENC_PRESET_AVCHD,
    ENC_PRESET_BD,
    ENC_PRESET_HDV_1440,
};

// Specifies whether Display Aspect Ratio(DAR)or Sample Aspect
// Ratio(SAR) is to be used
enum NVVE_ASPECT_RATIO_TYPE                    //C-lib only
{
    ASPECT_RATIO_DAR,
    ASPECT_RATIO_SAR,
};


// Surface Formats
enum NVVE_SurfaceFormat                        //C-lib only
{
    UYVY,
    YUY2,
    YV12,
    NV12,
    IYUV
};

// Picture Structure
enum NVVE_PicStruct                            //C-lib only
{
   TOP_FIELD = 0x1,
   BOTTOM_FIELD,
   FRAME_PICTURE
};

//Aspect Ratio Parameters
typedef struct _NVVE_AspectRatioParams         //Dshow only
{
    float fAspectRatio; // set as -1.0f for custom aspect ratio
    int iWidth;         // parameter valid only for custom aspect ratio
    int iHeight;        // parameter valid only for custom aspect ratio
```

```
    NVVE_ASPECT_RATIO_TYPE eType; // parameter valid only for custom
aspect ratio
}NVVE_AspectRatioParams;

//GPU attributes
typedef struct _NVVE_GPUAttributes
{
    int                     iGpuOrdinal;          // GPU device number
    char                    cName[256];           // string identifying
GPU device
    unsigned int            uiTotalGlobalMem;     // total global
memory available on device in bytes
    int                     iMajor;               // GPU device compute
capability major version number
    int                     iMinor;               // GPU device compute
capability minor version number
    int                     iClockRate;           // GPU clock
frequency in kilohertz
    int                     iMultiProcessorCount; // number of
multiprocessors on the GPU device
    NVVE_GPUOffloadLevel    MaxGpuOffloadLevel;   // max offload level
supported for this GPU device
} NVVE_GPUAttributes;

// Information passed on to EncodeFrame
typedef struct _NVEncodeFrameParams             //C-lib only
{
    int Width;
    int Height;
    int Pitch;
    NVVE_SurfaceFormat SurfFmt;
    NVVE_PicStruct PictureStruc;
    BOOL topfieldfirst;
    BOOL repeatFirstField;
    BOOL progressiveFrame;
    BOOL bLast;
    unsigned char *picbuf;    // pointer to yuv buffer
};

// Information passed to OnBeginFrame
typedef struct _NVVE_BeginFrameInfo            //C-lib only
{
    int nFrameNumber;    //Frame Number
    int nPicType;        //Picture Type

// Information passed to OnEndFrame
typedef struct _NVVE_EndFrameInfo              //C-lib only
{
    int nFrameNumber;    //Frame Number
    int nPicType;        //Picture Type
}

typedef struct _CUcontextlock_st *CUvideoctxlock;
```

```
// DirectShow Filter INVVESetting interface
DECLARE_INTERFACE_(INVVESetting, IUnknown)
{
    STDMETHOD(IsSupportedCodec)(THIS_ DWORD dwCodecType) PURE;
    STDMETHOD(IsSupportedCodecProfile)(THIS_ DWORD dwCodecType,DWORD
dwProfileType) PURE;
    STDMETHOD(SetCodecType)(THIS_ DWORD dwCodecType) PURE;
    STDMETHOD(GetCodecType)(THIS_ DWORD *pdwCodecType) PURE;
    STDMETHOD(IsSupportedParam)(THIS_ DWORD dwParamType) PURE;
    STDMETHOD(SetParamValue)(THIS_ DWORD dwParamType,LPVOID pData)
PURE;
    STDMETHOD(GetParamValue)(THIS_ DWORD dwParamType,LPVOID pData)
PURE;
    STDMETHOD(SetDefaultParam)(THIS_ void) PURE;
    STDMETHOD(GetSPSPPS)(THIS_ unsigned char *pSPSPPSbfr, int
nSizeSPSPPSbfr, int *pDatasize) PURE;
};

// C-library API Callback structures and functions
typedef void (_stdcall *PFNACQUIREBITSTREAM)(int nBytesInBuffer,
unsigned char *cb, void *pUserdata);
typedef void (_stdcall *PFNRELEASEBITSTREAM)(int nBytesInBuffer,
unsigned char *cb, void *pUserdata);
typedef void (_stdcall *PFNONBEGINFRAME)(const NVVE_BeginFrameInfo
*pbfi, void *pUserdata);
typedef void (_stdcall *PFNONENDFRAME)(const NVVE_EndFrameInfo *pefi,
void *pUserdata);

typedef _struct NVVE_CallbackParams
{
    PFNACQUIREBITSTREAM pfnacquirebitstream;
    PFNRELEASEBITSTREAM pfnreleasebitstream;
    PFNONBEGINFRAME pfnonbeginframe;
    PFNONENDFRAME pfnonendframe;
}NVVE_CallbackParams;

typedef void *NVEncoder;

HRESULT   stdcall NVCreateEncoder(NVEncoder *pNVEncoder);
HRESULT   stdcall NVDestroyEncoder(NVEncoder hNVEncoder);
HRESULT  __stdcall NVIsSupportedCodec(NVEncoder hNVEncoder,DWORD
dwCodecType);
HRESULT  __stdcall NVIsSupportedCodecProfile(NVEncoder hNVEncoder,DWORD
dwCodecType, DWORD dwProfileType);
HRESULT   stdcall NVSetCodec(NVEncoder hNVEncoder,DWORD dwCodecType);
HRESULT   stdcall NVGetCodec(NVEncoder hNVEncoder,DWORD *pdwCodecType);
HRESULT  __stdcall NVIsSupportedParam(NVEncoder hNVEncoder,DWORD
dwParamType);
HRESULT  __stdcall NVSetParamValue(NVEncoder hNVEncoder,DWORD
dwParamType, LPVOID pData);
HRESULT  __stdcall NVGetParamValue(NVEncoder hNVEncoder,DWORD
dwParamType, LPVOID pData);
```

```
HRESULT   stdcall NVSetDefaultParam(NVEncoder hNVEncoder);
HRESULT   stdcall NVCreateHWEncoder(NVEncoder hNVEncoder);
HRESULT __stdcall NVGetSPSPPS(NVEncoder hNVEncoder, unsigned char
*pSPSPPSbfr, int nSizeSPSPPSbfr, int *pDatasize);
HRESULT __stdcall NVEncodeFrame(NVEncoder hNVEncoder,
NVVE_EncodeFrameParams *pFrmIn, DWORD flag, void *pData);
HRESULT   stdcall NVGetHWEncodeCaps(void);
void __stdcall NVRegisterCB(NVEncoder hNVEncoder, NVVE_CallbackParams
cb, void *pUserdata));
```

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