

Spin Digital SDK

Optimized video and audio encoding, decoding, processing, and rendering libraries that simplify the creation of innovative and demanding media applications.

Product Highlights

- Powerful and efficient API for Windows, Linux, and macOS
 - Support for x86-64 and ARM64
 - Highly optimized CPU-based codecs
 - Real-time HEVC and VVC encoding and decoding
 - Flexible I/O for GPU, SDI, and ST 2110 devices
 - Video/image processing filters
 - HTTP and TS-over-IP streaming: HLS, DASH, UDP, RTP, SRT, RIST, Zixi
 - Screencasting and live transcoding
 - Extensive audio device support: WASAPI, SDI, ASIO, ST 2110
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SPIN SDK OVERVIEW

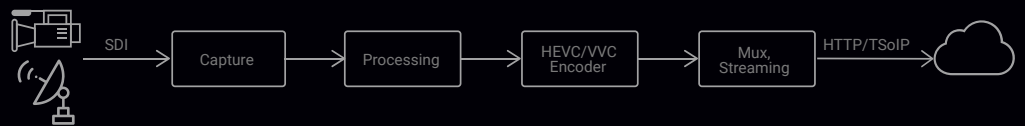
Spin SDK facilitates the creation of high-end media applications that require high-performance encoding, decoding, rendering, processing, capture or streaming. All these components can be easily connected to each other using an optimized media framework. Spin SDK codecs and processing modules have been extensively optimized in order to achieve the maximum possible performance and quality.

USE CASES

High-end Live Encoders

The core component of this use case is the HEVC and VVC encoding library, which is capable of real-time compression of videos in UHD resolutions, including 4K and 8K, and also in custom resolutions.

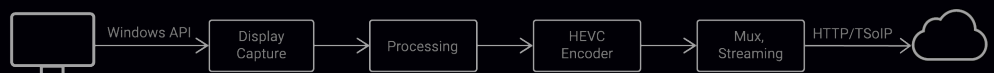
The I/O capture module receives a live signal (in SDI, ST 2110 or TS over IP) and compresses it using the video and audio encoders. The resulting streams are multiplexed and sent out either over TS/IP, HTTP, or both simultaneously. Optionally, the input video signal can be processed before compression in order to make changes to the resolution, transfer function, or color space, among other available filters.



Live Screencasting

The advanced I/O capture module also allows Windows desktops to be acquired up to 8K resolution. This feature enables ultra-high quality screencasting services for e-learning, remote diagnosis and engineering, among others.

Audiovisual content from the Windows desktop is captured, encoded by the HEVC or VVC real-time encoder, and the final stream is delivered to the target audiences over the Internet. All steps are performed within a single workstation or server reducing costs and improving usability.



Cloud Transcoding

Spin Digital's high-performance codec allows video transcoding in real-time while guaranteeing the quality and compression levels required by broadcast and streaming services.

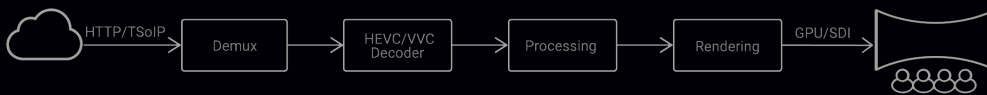
A live contribution stream is received, decoded and then re-encoded in HEVC or VVC, and sent out for distribution over the Internet. For Adaptive Bit Rate (ABR) streaming applications, several encoding instances can be launched in parallel to generate ladders with lower qualities and resolutions.



Immersive Media Players

With its high-performance CPU-based HEVC and VVC decoders supporting very high resolutions, the SDK enables high-quality media playback in large-screen immersive environments (domes, theaters, venues, video walls) or simply on 8K TVs.

The HEVC or VVC stream coming from the service provider (or simply an HEVC or VVC file) is received, decoded, rendered, and sent to the display device via GPU, SDI or ST 2110. Pixel-based operations such as resolution scaling or tone and gamut mapping can also be performed on the decoded video.



SPINENC: OPTIMIZED VIDEO ENCODING LIBRARY

Optimized CPU-based software encoders: HEVC, VC

High compression efficiency and high-performance implementation:

SIMD processing: SSE4.1, AVX2, AVX-512, VNNI, NEON

Scalable multithreading: wavefront, subpictures (VVC), frame parallelism, pipelining

Memory optimizations

Industry leading compression efficiency

Resolutions (pixels): 1920x1080, 3840x2160, 7680x4320, custom

Frame rates (fps): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60, 100, 119.88, 120

Color spaces: BT.601, BT.709, DCI-P3, BT.2020

HDR support: ST 2084 transfer function (PQ), ST 2086 HDR metadata, HLG

Rate control:

Broadcast-level CBR, constrained VBR

Constant quantizer, (constrained) constant perceptual quality

HRD model compliance

Runtime rate control adjustment

Quality optimizations:

Perceptually optimized encoding mode

Motion-compensated temporal filter for noise reduction

Dynamic GOP hierarchy depth

Low-latency

Guarantee minimal latencies in a range of operation points between:

High-efficiency (long GOP)

Low-delay (short GOP)

Real-time operation mode

Timecode SEI insertion

Statistical multiplexer (Statmux)

Combine bitrate of multiple live encoders in a shared pool to allow dynamic utilization based on the real-time needs of the video feeds

Implementation via callback API

Source code available of standalone statmux controller + client implementation in sample encoder



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VVC/H.266 ENCODER

Support for the VVC standard: Main 10 and Main 12 profiles

Color format: 4:2:0

Bit depths: 8-, 10-, 12-bit

Coding configurations:

Intra-only, random-access, low-delay, chunk-based

Hierarchical GOP sizes: 1, 2, 4, 8, 16, 32 frames

Presets: slower, slow, balanced, fast, faster

VVC specific tools:

Screen Content Coding (SCC)

HTTP streaming with open GOP

Subpictures (for parallelism)

HEVC/H.265 ENCODER

Support for the HEVC standard:

Main and Main 10 profiles

Range Extensions (HEVCv2) profiles

ARIB STD-B32 version 3.9 (8K with 4 slices)

Color formats: 4:2:0, 4:2:2, 4:4:4, RGB

Bit depths: 8-, 10-, 12-bit

Coding configurations:

Intra-only, random-access, low-delay, chunk-based

Hierarchical GOP sizes: 1, 2, 4, 8, 16, 32 frames

Presets: slower, slow, balanced, fast, faster

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SPINDEC: OPTIMIZED VIDEO DECODING LIBRARY

Optimized CPU-based software decoders: HEVC, VVC

High-performance implementation:

SIMD: SSE4.1, AVX2, AVX-512, VNNI, NEON

Multithreading: wavefront, advanced frame parallelism

Memory optimized:

Efficient pixel formats

Optimized caching, prefetching, streaming

External picture interface

On-the-fly compression to BC4 GPU texture format

VVC/H.266 DECODER

Support for the VVC standard:

Main 10 and Main 12 profiles

Multilayer Main 10 profile

Resolutions (pixels): 1920x1080, 3840x2160, 7680x4320, custom

Frame rates (fps): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60, 100, 119.88, 120

Color format: 4:2:0

Bit depths: 8-, 10-, 12-bit

Reference Picture Resampling (RPR):

Spatial scalability

Resolution switching in HTTP streaming with open GOP

Scaling window: zoom in, zoom out

Post-processing sharpening filter for spatial scalable streams

HEVC/H.265 DECODER

Support for the HEVC standard:

Main and Main 10 profiles

Range Extensions (HEVCv2) profiles

ARIB STD-B32 version 3.9 (8K with 4 slices)

Resolutions (pixels): 1920x1080, 3840x2160, 7680x4320, 15360x8640, custom

Frame rates (fps): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60, 100, 119.88, 120

Color formats: 4:2:0, 4:2:2, 4:4:4, RGB

Bit depths: 8-, 10-, 12-bit

Native decoding in bit packed and chroma interleaved formats

Error resilience for non-compliant inputs

SPINRENDER: HIGH-PERFORMANCE VIDEO RENDER ENGINE

GPU, SDI, and ST 2110 video rendering:

GPU rendering based on DirectX 12

CPU rendering for professional SDI and ST 2110 output

Color spaces: BT.601, BT.709, DCI-P3, BT.2020, full and limited range

Input video formats:

Color formats: 4:2:0, 4:2:2, 4:4:4, RGB

Bit depths: 8-, 10-, 12-bit

Pixel formats: planar, semi-planar, packed, bitpacked

Input transfer functions: SDR, PQ (ST 2084), HLG (BT.2100)

Render format: RGB 10-bit (GPU), 4:2:2 10-bit (SDI)

Tone and gamut mapping

360° video rendering:

Input projections: equirectangular, cubemap

Output projections: rectilinear for flat screens, cylindrical for curved screens

Multi-device interaction

Seamless resolution and format switching

Multi-device rendering: tiled, clone, alternate, with genlock synchronization

SpinLLRender: a dedicated low-latency renderer specialized for the lowest possible latency

SPINAUDRENDER: AUDIO RENDERING LIBRARY

Low-latency audio rendering

Output devices: WASAPI, 3G-SDI, 12G-SDI, ASIO, ST 2110

Sample formats: 16-bit, 32-bit, float

Multi-device rendering: SDI virtual output up to 64 channels

Internal and external clock support

Audio filters: volume control, resampling



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SPINFILTER: HIGH-PRECISION VIDEO PROCESSING FILTERS

Highly optimized for CPUs:

Software implementation (C++)

Fast algorithms

SIMD processing: SSE4.1, AVX2, AVX-512, VNNI, NEON

Tiled parallel execution

Automatic filter fusion for optimal locality

Video conversion filters:

Format conversion: chroma formats, bit depths, pixel layouts

Resolution scaling: nearest, bilinear, bicubic, lanczos

Color conversion: RGB/YUV, color space, SDR/HDR, custom LUT conversions

Cropping, padding

Overlay: blends an overlay into each image

Orientation: flip, rotate, mirror

Geometry conversion: equirectangular, cubemap, cylinder, viewport extraction

Texture compression: compresses or decompresses BC4 textures

Filter chain:

Filters can be used individually or combined for complex conversions

Automatic filter chain generation based on desired target format

Frame-level API

SPINRAWIO: HIGH-THROUGHPUT I/O LIBRARY

Live SDI capture:

4K up to 120 Hz, 8K up to 60 Hz

3G-SDI, 6G-SDI, 12G-SDI

Multi-channel tiled capture for single large surface (SLS):

Flexible input layouts

Example: 15360x2160 (4x1 4K) pixels over a 4x12G-SDI interface

Alternate frame capture for multiplying framerate:

Frames from multiple inputs are interleaved

Simultaneous multiple video link capture:

Multiple video channels to be captured simultaneously

Allow for frame-synchronized encoding and playback

Live ST 2110:

8K up to 120 Hz using single 100 Gbps cable

Live HDMI capture: 4K up to 60 Hz

Desktop capture:

APIs: Windows.Graphics.Capture (video), WASAPI (audio)

OS: Windows 10/11

Raw file reading:

Uncompressed YUV with JSON metadata

High-throughput implementation: real-time 8K and beyond

Exports capture clock

SPINSTREAM: LIVE STREAMING AND FILE (DE)MUXING

Send and receive

Exports stream clock

Container formats:

MP4 (ISOBMFF): HEVC, VVC

MPEG2-TS: HEVC, VVC

MKV: HEVC

FLV: HEVC

TS-over-IP streaming: UDP, RTP with optional FEC, SRT, RIST, Zixi

Streaming: HLS, DASH, RTMP

Dektec ASI and IP support

SPINLIBAV: FILE (DE)MUXING, AUDIO CODING, VIDEO DECODING

Container formats: MP4, MKV, FLV, TS

Streaming: HLS, DASH, RTMP

Audio encoding and decoding: AAC, Opus

Video decoding: MPEG2, H.264, DNxHD, ProRes



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SDK COMPONENTS

C/C++ libraries:

SpinEnc:	VC and HEVC encoders
SpinDec:	VC and HEVC decoders
SpinRender:	Video render engine
SpinAudRen:	Audio render engine
SpinFilter:	Video processing filters
SpinRawIO:	SDI/HDMI/IP and uncompressed YUV capture
SpinStream	Live streaming and file (de)muxing
SpinLibAV:	File (de)muxing and audio and video coding

Command line toolbox:

<i>streamenc:</i>	Real-time encoder
<i>streamplay:</i>	Stream player
<i>spindec:</i>	VC and HEVC decoders
<i>spinfilter:</i>	High-precision video processing filters
<i>spinrender:</i>	Raw file renderer (DirectX-12, SDI, ST 2110)

API reference documentation (HTML)

Application code examples

PLATFORM SUPPORT

Modules	Windows 10/11	Red Hat 8/9	Ubuntu 20.04 /22.04/24.04	macOS 14
VC and HEVC encoders	✓	✓	✓	✓
VC and HEVC decoders	✓	✓	✓	✓
Video render engine - DX12	✓			
Video render engine - SDI	✓	✓	✓	
Video render engine - ST 2110	✓	✓	✓	
Audio render engine - WASAPI	✓			
Audio render engine - SDI	✓	✓	✓	
Audio render engine - ASIO	✓			
Audio render engine - ST 2110	✓	✓	✓	
Video processing filters	✓	✓	✓	✓
SDI/HDMI/ST 2110 capture	✓	✓	✓	
Desktop capture	✓			
Streaming	✓	✓	✓	✓
Muxing, demuxing	✓	✓	✓	✓
Audio coding	✓	✓	✓	✓

HARDWARE REQUIREMENTS

CPU:	X86_64: SSE 4.1, AVX2, AVX512, VNNI. ARM: NEON
SDI capture:	AJA Kona 5 and Corvid 44/88, Blackmagic DeckLink 4K/8K
IP capture:	Mellanox Rivermax: ConnectX-6 Dx 100Gbps
HDMI capture:	Blackmagic DeckLink
SDI rendering:	AJA Kona 5 and Corvid 44/88, Blackmagic DeckLink 4K/8K
IP rendering:	Mellanox Rivermax - ConnectX-6 Dx 100Gbps
GPU rendering:	GPU with DirectX 12 support
ASI/IP:	DekTec DTA, standard ethernet ports



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