# Spin Digital SDK

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

## Product Highlights

- Powerful and efficient API for Windows and Linux
- Real-time 8Kp120 VVC decoding
- Real-time 8Kp60 HEVC encoding
- Real-time 16Kp60 HEVC decoding
- Flexible I/O for GPU and SDI devices
- Low-latency RTP streaming
- High-precision video processing filters
- Low-latency audio rendering

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# USE CASES

Spin SDK facilitates the creation of high-end custom applications that require high-performance encoding, decoding, rendering, processing, SDI capture or streaming. All these components can be easily connected to each other using an optimized media framework which is included in the SDK in order to achieve the maximum possible performance.

### High-End Custom Live Encoder

The core component of this use case is the HEVC encoder library which is capable of real-time compression of videos in standard formats including 4K and 8K as well as in custom resolutions.

The encoder receives the signal from the I/O capture module and sends out the stream either over MPEG2-TS over IP (TSoIP) or HLS, or simultaneously. Optionally, the input signal can be processed before compression in order to make changes to the resolution, transfer function, or color space, among other available filters.
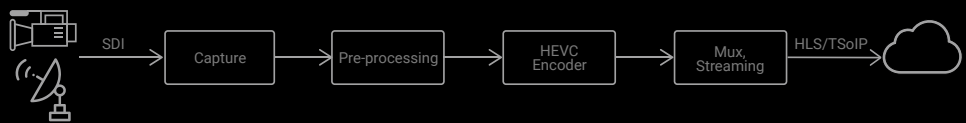


### 8K Cloud Transcoder

Spin Digital's high-performance codec allows 8K video transcoding at unprecedented speed while guaranteeing the quality and compression levels required by broadcast and VoD services.

The contribution stream in HEVC, H.264, or ProRes is decoded and then encoded in HEVC 4:2:0 10-bit to send out the distribution stream over TSoIP or HLS, or simultaneously. For Adaptive Bit Rate (ABR) streaming applications, several encoding instances can be launched in parallel to generate ladders with lower qualities and resolutions.
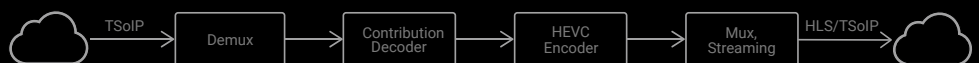
**Immersive Media Player**

With its high-performance CPU-based decoder supporting flexible resolutions up to 16K, the SDK enables high-quality media playback in large-screen immersive environments (domes, theaters, venues, video walls) or simply on 8K TVs.

The HEVC stream coming from the service provider (or simply an HEVC file) is decoded and rendered to send out the signal via SDI (3G or 12G) or HDMI (2.0 or 2.1). Pixel-based operations such as resolution scaling or tone and gamut mapping can also be performed on the decoded video.
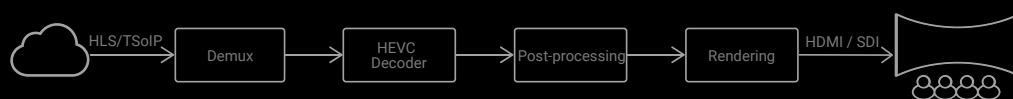


**Enhanced Editing Software and Game Engines**

The SDK modules have been optimized to provide the quality and performance required by post-production professionals and creative studios working with ultra-high resolution formats.

Existing video editing software and game engines can be upgraded, or simply enhanced with plugins, with innovative tools such as live streaming capture, high-quality 8K HEVC renders, 8K/12K 360°/VR video processing, and immersive playback.
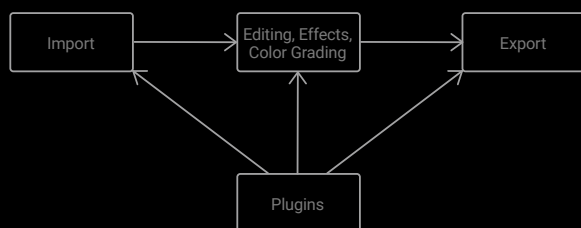
# HEVC/H.265 ENCODER

Support for the HEVC standard:

        Main and Main 10 profiles

        Range Extensions (HEVCv2) profiles

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

Resolutions (pixels):

        1920x1080 (1080p), 3840x2160 (4K), 7680x4320 (8K)

        Custom resolutions

Frame rates (fps):  25, 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

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

HDR support: ST2084 transfer function (PQ), ST2086 HDR metadata, HLG

Coding configurations:

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

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

        Presets: balanced, fast, faster

        Configurable HRD buffer

Minimum guaranteed end-to-end latency:

        High-efficiency mode: 2680 ms

        Low-latency mode: 470 ms

Rate control:

        Broadcast-level CBR

        Constrained VBR

Real-time operation mode

Performance optimizations:

        Highly optimized for recent CPUs

        Advanced multithreading

        SIMD processing: AVX2, AVX-512, VNNI

## VVC/H.266 DECODER

Support for the VVC standard:

    Main 10 profile

    Multilayer Main 10 profile

Resolutions (pixels):

    1920x1080 (1080p), 3840x2160 (4K), 7680x4320 (8K)

    Custom resolutions

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

Color format: 4:2:0

Bit depths: 8-, 10-bit

Scalability: temporal, spatial, quality (SNR)

Performance optimizations:

    Advanced multithreading: wavefront, frame-level, frame decoupled

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

Efficient pixel formats:

    planar, semi-planar, packed

    BC4 texture compression


## 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 (1080p), 3840x2160 (4K), 7680x4320 (8K), 15360x8640 (16K)

    Custom resolutions

Frame rates (fps):  25, 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

Error resilience for non-compliant inputs

Performance optimizations:

    Advanced multithreading: wavefront, frame-level, frame decoupled

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

Efficient pixel formats:

    planar, semi-planar, packed

    BC4 texture compression

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## VIDEO RENDER ENGINE

High-performance render engine:

      GPU rendering based on DirectX 12

      CPU rendering for professional SDI 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 (ST2084), HLG (BT.2100)

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

Support for 360° 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


## AUDIO RENDER ENGINE

Low-latency audio rendering

Output devices: WASAPI, 3G and 12G SDI (AJA)

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

Multi-device rendering

Internal and external clock support

# VIDEO PROCESSING FILTERS

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

Highly optimized for CPUs: memory locality, SIMD, multithreading

# I/O MODULE

SDI capture: 3G and 12G (AJA)

Multichannel tiled capture for non-broadcast standards:

Example: 15360x2160 (4x1 4K) pixels over a 12-G SDI card

File capture: uncompressed YUV

Exports capture clock

# STREAMING MODULE

Send and receive

Exports stream clock

MPEG2-TS over IP: UDP and RTP (optional FEC)

Dektec and Socket API

# OTHER FEATURES

Video and audio muxing and demuxing

AAC audio coding

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# SDK COMPONENTS

C/C++ libraries:

| | |
|---|---|
| SpinEnc: | HEVC encoder |
| SpinDec: | VVC and HEVC decoders |
| SpinRender: | Video render engine |
| SpinAudRen: | Audio render engine |
| SpinFilter: | Video processing filters |
| SpinRawIO: | SDI and uncompressed YUV capture |
| SpinStream | Streaming input and output |
| SpinLibAV: | Muxing, demuxing, audio coding |

Command line toolbox:

| | |
|---|---|
| *streamenc:* | Real-time encoder |
| *streamplay:* | Stream player |
| *spindec:* | HEVC decoder |
| *spinfilter:* | High-precision video processing filters |
| *spinrender:* | Raw file renderer (DirectX-12 and SDI) |

API reference documentation (HTML, PDF)

Application code examples

# PLATFORM SUPPORT

| Modules | Windows 8.1 | Windows 10 | Red Hat 7/8 | Ubuntu 18.04 |
|---|:---:|:---:|:---:|:---:|
| HEVC encoder | ✓ | ✓ | ✓ | ✓ |
| HEVC and VVC decoders | ✓ | ✓ | ✓ | ✓ |
| Video render engine - DX12 | x | ✓ | x | x |
| Video render engine - SDI | ✓ | ✓ | ✓ | ✓ |
| Audio render engine - WASAPI | ✓ | ✓ | x | x |
| Audio render engine - SDI | ✓ | ✓ | ✓ | ✓ |
| Video processing filters | ✓ | ✓ | ✓ | ✓ |
| Capture | ✓ | ✓ | ✓ | ✓ |
| Streaming | ✓ | ✓ | ✓ | ✓ |
| Muxing, demuxing, audio coding | ✓ | ✓ | ✓ | ✓ |

# MINIMUM REQUIREMENTS

| | |
|---|---|
| CPU: | X86_64 with SSE 4.1 |
| GPU: | NVIDIA Quadro Maxwell, AMD Radeon Pro |
| SDI: | AJA Kona 5 (12G), AJA Corvid 44 (12G), AJA Corvid 88 (3G) |
| ASI/IP: | Dektec DTA 2160, Dektec DTA 2162, standard ethernet ports |

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