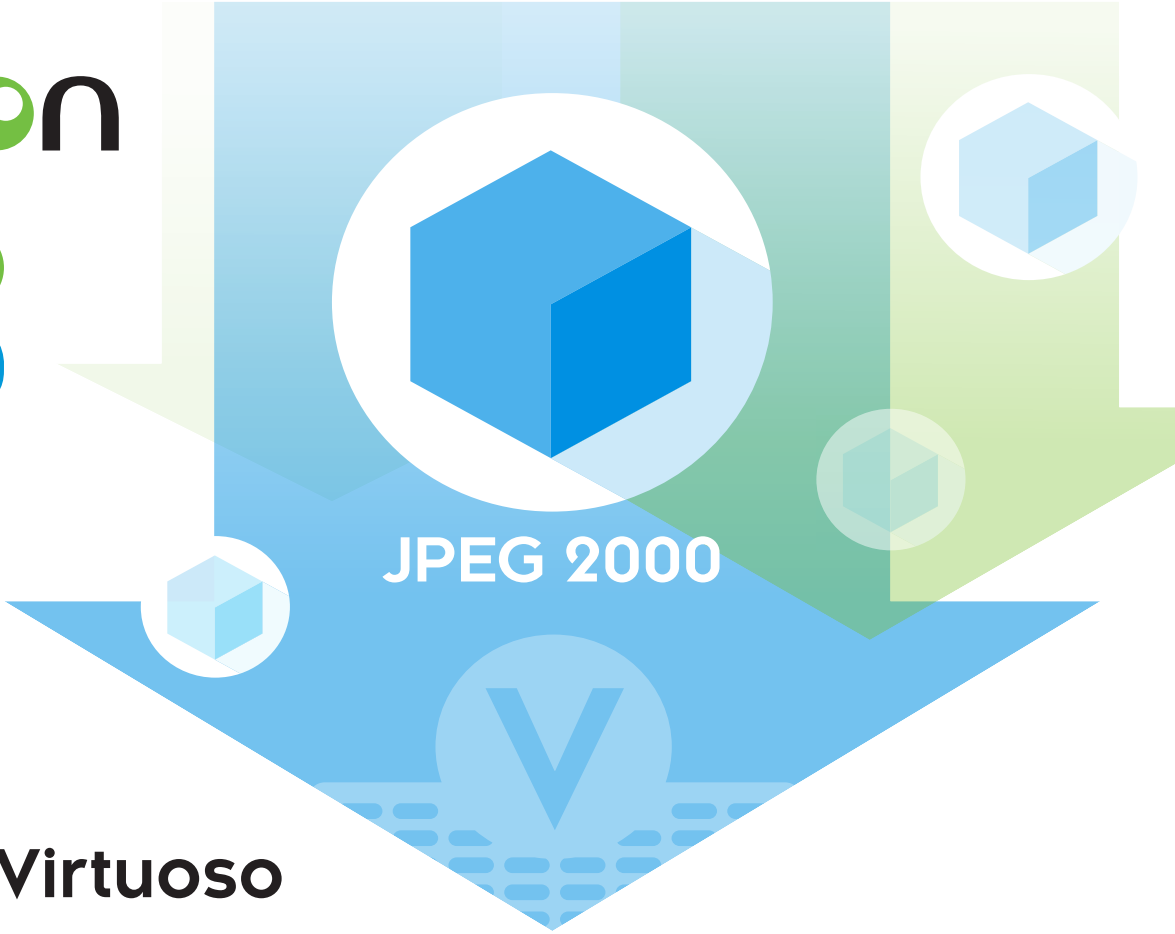
datasheet

Virtuoso Media Function



Nevion Virtuoso

JPEG 2000

Nevion Virtuoso's JPEG 2000 media function saves bandwidth while providing visually lossless compressed video, transparent audio and data, at ultra-low latency.

Nevion Virtuoso can run multiple instances of the JPEG 2000 Media Function on a single platform with built-in network aggregation to 1 or 10G Ethernet.

The VSF TR-01 compliant TS over IP encapsulation ensures perfectly synchronized transport of video, audio and ancillary data, as well as interoperability with 3rd party equipment.

The JPEG 2000 Media Function runs on the Virtuoso High Bit Rate Media Accelerator and supports electrical and optical SDI interfaces via video SFPs and Nevion breakout cables. Compressed signals are aggregated on the 1/10G Ethernet interfaces of the Virtuoso MI/RE Uplink Module or the Virtuoso FA built-in interfaces.

A single JPEG 2000 media function supports encoding or decoding of up to 4 HD/3G signals, providing, for example, 28 encoders per 1RU in Virtuoso MI or 20 encoders per 1RU in Virtuoso RE.

The Nevion Virtuoso JPEG 2000 Media Function, combined with Nevion's advanced protection mechanisms, enables broadcasters to utilize cost-efficient IP links for the real-time transport of professional media with low bandwidth utilization, combined with high quality and availability.

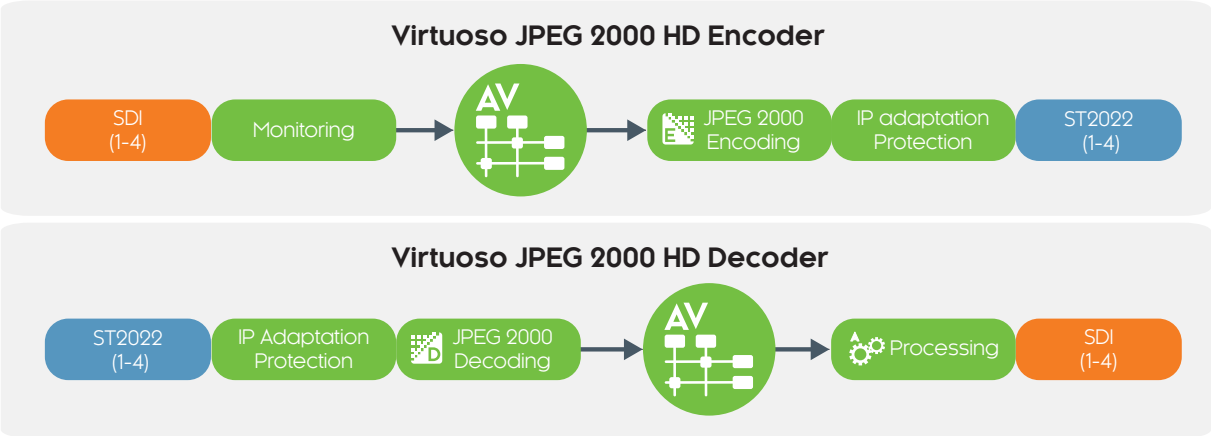
Applications

- Professional broadcast contribution
- Live sports and event contribution
- Studio-to-studio media exchange
- Managed video services over IP

Key features

- Multi-channel JPEG 2000 encoding and decoding
- Encoder, Decoder or codec (2x encoder plus 2x decoder) modes
- Visually lossless VQ and low multi-generation loss
- Transport of SD, HD and 3G-SDI over IP/ GigE
- UHD,4K and HFR/Super slo-mo camera support with multi-link synchronization
- Interoperability with 3rd party through VSF TR-01
- Very low end-to-end latency 3-4 frames with TR-01 and sub-frame with ultra low latency (ULL) mode
- Supports FEC, SIPS / SMPTE 2022-7 and Launch Delay Offset (LDO) IP protection mechanisms
- Integrated frame synchronization on decoder
- User-friendly web GUI for monitoring and control
- Thumbnails for input/output confidence monitoring
- Built-in TS monitoring (ETSI TR 101 290 Priority 1) of encoder output and decoder input, with option for Pri 2 and Pri 3 monitoring including PCR validation
- Software license approach ensures easy and future-proof upgrade path

Virtuoso JPEG 2000 Media Function



JPEG 2000 compression technology

Each frame/field is encoded with 4:2:2 10-bit JPEG 2000 Part 1 image compression, typically providing visually lossless video quality using a fraction of the bandwidth required for uncompressed video. Further, JPEG 2000 has excellent properties in terms of being robust against multi-generation encoding/decoding, which provides improved quality headroom in production.

High density and flexibility

The JPEG 2000 media function uses the Virtuoso HBR10 High Bitrate Accelerator. The media function has 3 operational modes; encoder, decoder or bi-directional (2 encoder + 2 decoders). In all modes, it can support up to 4 channels per accelerator, giving a density of 28 channels in Virtuoso MI and 20 channels in Virtuoso RE (both 1RU). Each channel can be an SD, HD or 3G-SDI signal (up to 1080p 59.94 Hz).

UHD/4K and slow motion feeds

Multi-link synchronization enables transport of Quad-Link UHD/4K signals, HFR/slow motion camera feeds and stereoscopic 3D. Synchronization works across all signals in a Virtuoso MI or RE encoding/decoding signal chain.

Transparent audio & ancillary data

The JPEG 2000 media function supports transmission of up to 16 channels of embedded audio for SD, HD and 3G-SDI. Handling of embedded audio, whether it's linear PCM or pre-compressed audio, is fully transparent. Similarly, handling of ancillary data such as closed captioning, active format description, time code and other metadata is fully transparent line-by-line.

Standards compliant transport

The software uses VSF TR-01 JPEG 2000 transport, in TS over IP ensuring compatibility with 3rd parties.

Ultra low latency

The software supports the new VSF TR-01 JPEG 2000 ultra low latency mode with sub-frame latency end-to-end.

Test image transmission

An encoder can be configured to transmit an internally generated test image or an uploaded image at a configurable, constant bitrate, with configurable text overlays and moving patterns, to allow efficient testing of contribution links prior to a live event.

Robust operation with frame sync

The decoder includes a number of features to ensure a robust operation and graceful degradation in the presence of IP transport impairments; buffering for IP jitter compensation, packet reordering, error correction and highly efficient error concealment, and a built-in frame synchronizer with analog and digital sync inputs. The encoder supports SDI input switching with built-in frame store for clean changeover on loss of input.

Protection and reliability

JPEG 2000 encoding and decoding can be combined with Forward Error Correction (FEC), Seamless IP Protection Switching (SIPS) compliant to SMPTE 2022-7, as well as Launch Delay Offset (LDO).

Network redundancy with ST2022-7

Transmitting the same RTP/IP stream across dual, fully diverse network links enables receivers/decoders to utilize SMPTE 2022-7 Seamless IP Protection Switching (SIPS), which gives error-free transport even in case of severe packet loss or link outages as long as a packet arrives on either of the two network links.

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Virtuoso JPEG 2000 Media Function

Video formats

SD-SDI	SMPTE ST 259-C 625i25, 525i29.97
HD-SDI	SMPTE ST 292/ST 296/ST 274/ST 2048 1280 x 720p: 50/59.94/60 1920 x 1080i: 25/29.97/30 1920 x 1080p: 23.98/24/25/29.97/30
3G-SDI	SMPTE 424 (Level A)/ST 274/ST 2048 1920 x 1080p: 50/59.94/60
UHD and 4K	Transmit or receive 1 UHD or 4K 2160p signal using 4 synchronized HD or 3G-SDI signals (square division)

SDI interfaces

SDI interfaces	Up to 4 inputs and 4 outputs per accelerator Video SFP with options for: - Dual channel SDI RX (input) - Dual channel SDI TX (output)

Video compression

Video compression	JPEG 2000 Part 1 Broadcast Profile (ISO/IEC 15444-1 and VSF TR-01 profiles for HD/3G)
Video sampling	YCbCr, 4:2:2,10 bit per component
Color space	ITU-R Rec BT.709
Number of channels	Up to 4 channels of encoding (or decoding) per Accelerator. Each channel is independently configurable for SD, HD or 3G.

Audio and ancillary data formats

Embedded audio	8 AES3 stereo channel pairs / 4 AES groups (user selectable), 20 or 24-bit, transparent for linear PCM and non-PCM audio
Ancillary data	Fully transparent for ancillary data, including but not limited to Time code (SMPTE 12M), Closed captioning (SMPTE 334-1), Active format description (AFD, SMPTE 2016-3) and OP-47.
Audio/video sync	+/- 2 ms

Video/audio processing

Frame sync	Integrated frame store on SDI input/SDI output with option to lock to reference sync.
Sync input format	Analog video sync. PTP via Uplink module in MI/RE SDI input via HBR accelerator.
Test image	Color bar, custom color or image. Configurable text overlay and moving box
Audio processing	Audio mono shuffling. Audio delay up to 10 seconds per channel. Audio gain / level control per channel. Option for automatic Dolby E re-alignment. Processing available on decoder SDI output.
Input signal loss	Freeze frame, option to fallback to test image

MPEG-2 Transport Stream

DVB-ASI	ETSI EN 50083-9, Annex B, 188 bytes/pkt
TS over IP	SMPTE 2022-2 RTP/UDP/IP (CBR)
Input TS bitrate	Encoder: 20 Mbps to 400 Mbps (SPTS/MPTS)
Output TS bitrate	Encoder: 20 Mbps to 400 Mbps (SPTS)
Program information	Encoder output: PAT, PMT
JPEG 2000 video	VSF TR-01:2013 full-frame encoding mode VSF TR-01:2018 ultra low latency mode Up to 200 Mbps for HD Up to 400 Mbps for 3G
AES3 audio	SMPTE 302 pass-through (48 kHz, 20 or 24-bit) One audio channel pair per PID
Ancillary data	SMPTE 2038 pass-through up to 1 Mbps

Monitoring

TS monitoring	ETSI TR 101 290 Priority 1 alarms ETSI TR 101 290 Priority 2/3 alarms (Licensed option).
Content monitoring	Thumbnails of SDI video input and output Audio level bars.
Advanced monitor	Template based monitoring for video/audio. Video black and freeze frame detection. Audio silence and peak level detection. (Licensed option)
Alarm log	Persistent alarm log with 100,000 entries.

IP transport and protection

TS/IP encapsulation	VSF TR-01 TS over RTP/UDP/IP. Virtuoso MI: HBR module running UPLINK-10G media function is used for TS/IP input/output. Virtuoso FA: main board is used for TS/IP input/output.
Protocols	RTP, UDP, IP, ICMP, ARP, IGMPv2/v3, Diffserv/TOS, 802.1Q (VLAN tag), 802.1P (VLAN priority).
Jitter / PDV	Buffering for IP jitter/PDV compensation Up to 50 ms receiver buffer.
FEC	Forward Error Correction compliant to SMPTE ST 2022-1/2.
Extended FEC	Support for extended matrix size L*D < 960, max L+D 244, e.g. 240 x 4)
SMPTE ST 2022-7	Hitless/seamless protection switching compliant to SMPTE ST 2022-7. Up to 450 ms differential path delay in MI Up to 200 ms differential path delay in FA
LDO	Launch delay offset for single path temporal diversity using SMPTE ST 2022-7)..

Media Server Appliance support

Please refer to Nevion Virtuoso Platform datasheet for details.	
Virtuoso MI	Supported in version 1.2 or higher
Virtuoso RE	Supported in version 1.0.8 or higher
Virtuoso FA	Supported in version 2.9 or higher

Accelerator requirement

Accelerator	HBR media accelerator (HBR10)
Description	Multi-channel high bitrate Media Accelerator (HW module). 4x SFP+ ports that accommodate a combination of 10GE SFP+ and video SFPs.
Product codes	VIRTUOSO-HW-HBR-SFP4 (24204)
SFP configuration	Port 1: Video SFP for SDI input (E4 and E2D2) Port 2: Video SFP for SDI input (E4) Port 3: Video SFP for SDI output (D4) Port 4: Video SFP for SDI output (D4 and E2D2)
Video SFP support	Non-MSA 270 Mb/s to 3 Gb/s SD-SDI, HD-SDI, 3G-SDI Optical and electrical variants
Power consumption	Maximum 45W

Software media functions

J2K-HD-E4	JPEG 2000 HD Encoder (4 channels)
J2K-HD-D4	JPEG 2000 HD Decoder (4 channels)
J2K-HD-E2D2	JPEG 2000 HD Bidirectional Encoder (2 channels) and Decoder (2 channels).

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