

JPEG 2000 DCI

Nevion Virtuoso

JPEG 2000 DCI Encoding and Decoding

Using JPEG 2000 compression, the NeviON Virtuoso allows studios and production companies to share pristine looking content in real-time across the world, improving cooperation and production workflows.

The Virtuoso JPEG 2000 DCI Media Function provides visually lossless compression in real-time, maintaining full color fidelity and accuracy, while using a fraction of the bandwidth of uncompressed transport.

Nevion Virtuoso hosts multiple JPEG 2000 encoders and decoders for HD/2K and UHD/4K real-time transport over IP, on a single platform with built-in aggregation to 1/10G Ethernet.

A single JPEG 2000 DCI media function supports encoding or decoding of 2 channels of HD 4:2:2 10-bit or 4:4:4 12-bit signals, providing up to 14 channels of HD/2K encoding or decoding in Virtuoso M1.

The power of NeviON's Virtuoso JPEG 2000 DCI Media Function, combined with NeviON's advanced protection mechanisms, enables the real-time transport of professional media with low bandwidth utilization, combined with high quality and availability.

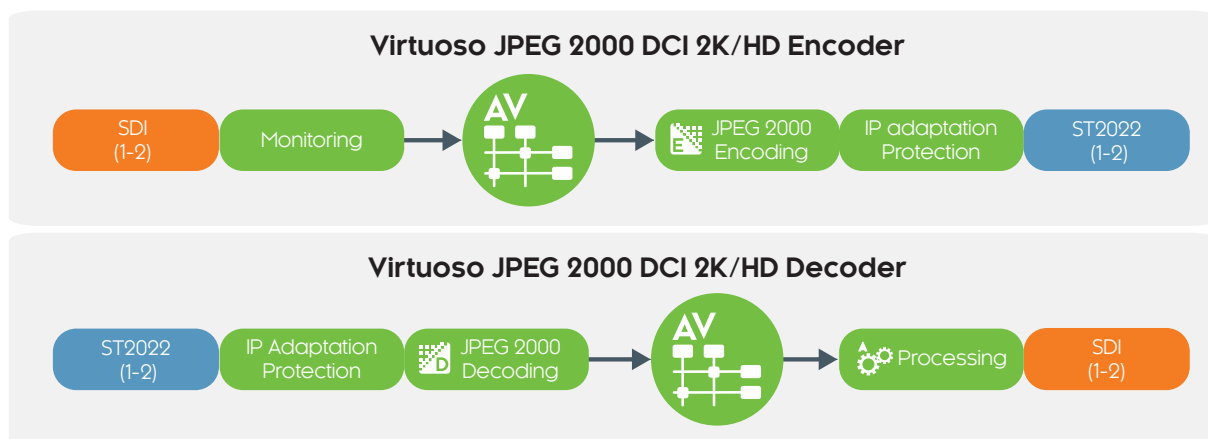
The functionality in Virtuoso is based on a software license approach, which ensures an easy and future-proof upgrade path.

Applications

- Real-time remote review and approval sessions
- Real-time remote color correction and grading
- Connectivity for screening rooms anywhere

Key features

- Standards-based JPEG 2000 compression maintaining full color fidelity.
- Multi-channel JPEG 2000 encoding and decoding.
- Visually lossless VQ and low multi-generation loss.
- Extensive format support
 - Color spaces (YCbCr, RGB, XYZ)
 - Color sampling (4:4:4 12-bit and 4:2:2 10-bit)
 - HD and 2K 1080p film and production formats
 - UHD/4K and Stereoscopic 3D supported via multi-link synchronization
 - High Dynamic Range (HDR) and Wide Color Gamut (WCG) support
- Reliable IP transport over any distance
 - SMPTE ST 2022-7 for all RTP input flows
 - Forward Error Correction (FEC)
- User-friendly web GUI for monitoring and control.
- Extensive monitoring with thumbnails and audio bars for input/output confidence monitoring.



JPEG 2000 compression technology

Each frame/field is encoded with 4:4:4 12-bit or 4:2:2 10-bit JPEG 2000 Part 1 image compression, typically providing visually lossless video quality using only 10-15% of the bandwidth required for uncompressed video. Further, JPEG 2000 has excellent properties in terms of preserving color accurately and providing graceful impact on video quality at lower bitrates.

High density and flexibility

The JPEG 2000 DCI Media Function uses the Virtuoso High Bitrate (HBR) accelerator card.

When processing either 4:4:4 12-bit or 4:2:2 10-bit signals there are 2 operational modes: 2-channel encoder or 2-channel decoder, giving a density of 8 channels in Virtuoso FA or up to 14 channels in Virtuoso MI.

In Virtuoso MI, a separate HBR card running the Uplink media function is required for TS-IP adaptation and aggregation.

UHD/4K and Stereoscopic 3D

Multi-link synchronization enables transport of Quad-Link UHD/4K signals, slow motion camera feeds and stereoscopic 3D. Synchronization works across all encoders or decoders within a single Virtuoso unit.

Transparent audio & ancillary data

The JPEG 2000 Media Function supports transmission of up to 16 channels of embedded audio. 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.

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 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.

IP transport protection

JPEG 2000 compression can be combined with Forward Error Correction (FEC), hitless/seamless protection switching compliant to SMPTE ST 2022-7.

Transmitting the same RTP/IP stream across dual, fully diverse network links enables receivers/decoders to utilize SMPTE ST 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.

Video formats

HD-SDI (4:2:2 10-bit)	SMPTE ST 292/ST 296/ST 274/ST 2048 1280 x 720p: 50/59.94 1920 x 1080i: 25/29.97 1920 x 1080PsF: 23.98/24/25 1920 x 1080p: 23.98/24/25 2048 x 1080PsF: 23.98/24/25 2048 x 1080p: 23.98/24/25
3G-SDI (4:2:2 10-bit)	SMPTE 424 (Level A)/ST 274/ST 2048 1920 x 1080p: 50/59.94 2048 x 1080p: 47.95/48/50/59.94
3G-SDI (4:4:4 12-bit)	SMPTE 424 (Level A+B DL)/ST 274/ST 2048 1920 x 1080PsF: 23.98/24/25 1920 x 1080p: 23.98/24/25 2048 x 1080PsF: 23.98/24/25 2048 x 1080p: 23.98/24/25
UHD/4K	Transmit or receive 1 UHD/4K 2160p signal using 4x HD or 3G-SDI channels (square division) Requires ML54 multi-link sync option.

Video compression

Video compression	JPEG 2000 Part 1 Broadcast Profile (ISO/IEC 15444-1)
Color space	YCbCr, RGB, XYZ
Color conversion	Option to enable or disable JPEG 2000 ICT for RGB/XYZ to YCbCr
Color sampling	4:2:2, 10-bit per component 4:4:4, 12-bit per component
Number of channels	2 channels per accelerator (any format) 4 channels per accelerator for 4:2:2 10-bit
Encoding, bitrate	Up to 350 Mbit/s per channel

Audio and ancillary data

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 and 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 via Virtuoso FA base unit. SDI input via HBR accelerator.
Test image	Color bar, custom color or image. Configurable text overlay and moving box
Audio processing	Audio mono shuffling, delay and gain Processing available on decoder SDI output.
Input signal loss	Freeze frame, option to fallback to test image

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 350 Mbps (SPTS/MPTS)
Output TS bitrate	Encoder: 20 Mbps to 350 Mbps (SPTS)
Program information	Encoder output: PAT, PMT
JPEG 2000 video	JPEG 2000 ISO/IEC 15444-1 Up to 400 Mbps per channel
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

Input signal monitoring

RTP/IP monitoring	Bit rate per flow Packet/datagram rate per flow RTP stream continuity Packet delay variation (PDV/jitter) Packet inter-arrival time (IAT)
Basic TS monitoring	ETSI TR 101 290 Pri 1 alarms Listing of services and components Listing of PIDs with bit rates and counters Listing of PSI/SI tables TS and per PID bitrate alarms
Adv. TS monitoring	ETSI TR 101 290 Pri 1 and 2 alarms (option) PCR validation and jitter measurements PSI/SI table decoding and analysis
Video monitoring	Thumbnail picture
Audio monitoring	Audio level bars
Alarm log	Persistent alarm log with 100,000 entries.

IP transport and protection

TS/IP encapsulation	MPEG-2 TS over RTP/UDP/IP. Virtuoso MI Uplink HBR card for IP in/out Virtuoso FA main board for IP in/out
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 SMPTE ST 2022-1/2
SMPTE ST 2022-7	Hitless/seamless protection switching compliant to SMPTE ST 2022-7.
LDO	Launch delay offset for single path temporal diversity using SMPTE ST 2022-7 (Virtuoso FA).

Media Server Appliance support

Virtuoso MI	Yes (v1.6.42 or higher)
Virtuoso FA	Yes (v3.2.22 or higher)
Features	See Virtuoso platform datasheet

Software media functions

J2K-2K-E2-DCI	JPEG 2000 2K/HD Encoder DCI (2 channels)
J2K-2K-D2-DCI	JPEG 2000 2K/HD Decoder DCI (2 channels)

HBR Media Accelerator

Description	10G Media Accelerator hardware module. 4x SFP+ ports that can accommodate a combination of 1GE SFP, 10GE SFP+, ASI, SDI video or MADI audio interfaces.
Product codes	VIRTUOSO-HW-HBR-SFP4 (24204)
Connectors	Four (4) SFP+
SFP config (Uplink)	Port 1-4 individually configurable for: 10 GigE (10GBase-SR/LR) 1 GigE (1000Base-X)
SFP config (J2K Enc)	Port 1: Video SFP dual RX (SDI input) Port 2: Not used Port 3: Not used Port 4: Not used
SFP config (J2K Dec)	Port 1: Video SFP dual TX (SDI test output) Port 2: Not used Port 3: Video SFP dual TX (SDI output) Port 4: Not used
Video SFP support	Non-MSA 270 Mb/s to 3 Gb/s HD-SDI, 3G-SDI Optical and electrical variants
Power consumption	Maximum 45W



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