datasheet

Virtuoso
Media Function

Nevion Virtuoso

JPEG XS UHD/HD

Nevion Virtuoso's JPEG XS UHD/HD Media Functions offers multi-channel JPEG XS encoding or decoding with native SMPTE 2110 video or SDI baseband interfaces.

JPEG XS (ISO/IEC 21122) is an encoding standard for video that achieves pristine visually lossless output (both for one-time and multiple concatenated compression), at sub-millisecond latency, i.e. a fraction of a video frame. High quality compression is achievable with ratios up to 10:1 and beyond, depending on the application.

This makes JPEG XS extremely attractive for low latency real-time transport of HD and 4K/UHD video over wide-area networks (WANs). It also makes it suitable for bandwidth-constrained campus and facility local area networks (LANs) when uncompressed transport is not a viable option.

The JPEG XS TR-08 Media Functions run on the Virtuoso HBR and HBR25 accelerators, supporting electrical and optical SDI interfaces via video SFPs, and ST2110 IP video/audio via dual 10GE or 25GE.

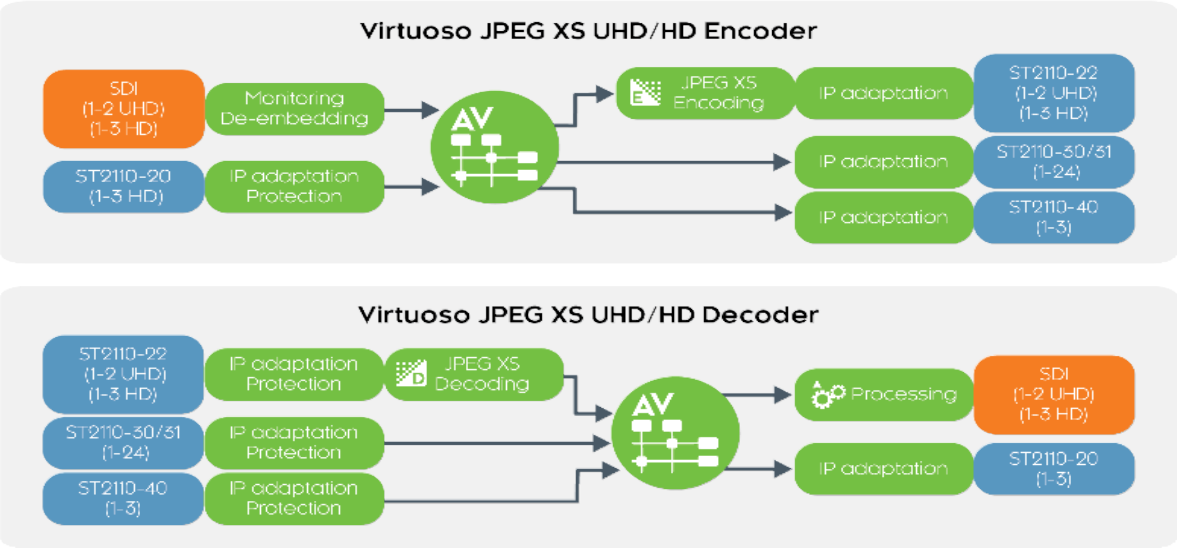
A single JPEG XS instance supports encoding or decoding of up to 4 HD or 2 UHD signals, providing up to 32 HD or 16 UHD channel encoding/decoding in the 8 slot Virtuoso MI appliance.

Applications

- IP in the Facilities
- Distributed IP production infrastructure
- Remote and at-home production
- In-house/campus media networks

Key features

- JPEG XS compression for video
  - Multi-channel UHD/HD encoding/decoding
  - Visually lossless compression
  - Ultra low sub-frame end-to-end latency
- Standards-based interfacing
  - JPEG XS in IP ST2110-22 (VSF TR-08)
  - Native ST2110 interfacing (-10/20/21/30/31/40)
  - HD/3G/12G-SDI optical and electrical via SFPs
- Video/Audio processing
  - Built-in frame synchronizer with PTP support
  - Audio and ANC embedding/de-embedding
  - Automatic audio/ANC synchronization
  - Audio routing, shuffling, gain and delay
- Stream protection
  - SMPTE 2022-7 for all RTP media input flows
  - Clean video switching (MBB, BBM)
- Monitoring and control
  - Thumbnails of input and output video
  - NMOS IS-04/05/08 and REST API control



Functional diagram (HBR 10G)

High video quality and low latency

JPEG XS (ISO/IEC 21122) is a new encoding standard for video that achieves pristine visually lossless output at sub-millisecond latency, i.e. a fraction of a video frame. In addition, JPEG XS is also highly robust to multiple concatenated compression cycles, which is common in live broadcast production and transport applications.

High quality compression is achievable with ratios up to 10:1 and beyond, depending on the application.

Adding JPEG XS to SMPTE 2110

The Nevion Virtuoso JPEG XS media function offers multi-channel UHD/HD encoding or decoding capabilities on a single Virtuoso accelerator module (with each Virtuoso supporting multiple accelerator modules).

The input to the JPEG XS encoder is uncompressed video in either SDI or IP (SMPTE ST 2110-20) formats, and the output of the encoder is compressed JPEG XS video transported over RTP/IP as per the IETF RTP payload format for JPEG XS (RFC 9134) and SMPTE ST 2110-22.

For SDI inputs, embedded audio and ancillary data is de-embedded and carried as SMPTE ST 2110-30/31/40 flows on IP.

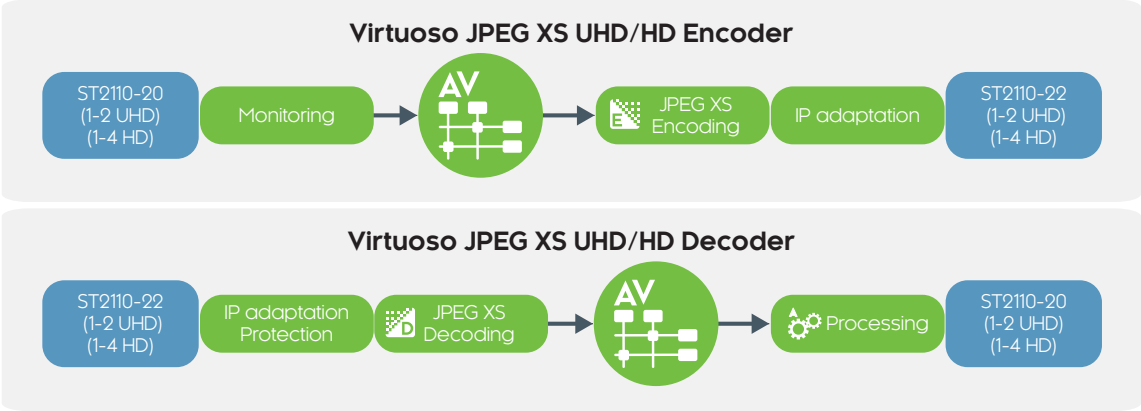
On the decoder side, SMPTE ST 2110-22 flows carrying compressed JPEG XS video are decoded and output as SMPTE ST 2110-20 video on IP, or embedded with SMPTE ST 2110 audio and ancillary data on SDI output.

High density and flexibility

Running on the Virtuoso HBR 10G accelerator, the JPEG XS media function supports encoding or decoding of up to 3 HD or 2 UHD channels, giving a density of 24 HD or 16 UHD channels in Virtuoso MI.

Running on the Virtuoso HBR 25G accelerator, the JPEG XS media function supports encoding or decoding of up to 4 HD or 2 UHD channels, giving a density of 32 HD or 16 UHD channels in Virtuoso MI.

A mix of encoding and decoding in the same Virtuoso is possible and is configured per HBR accelerator. Similarly, HD and UHD can be combined and is configured per HBR accelerator.



Functional diagram (HBR 25G)

Standards compliant transport

The software uses VSF TR-08 JPEG XS transport, in ST 2110-22 over IP ensuring compatibility with 3rd parties.

Automatic A/V synchronization

The JPEG XS encoder and decoder includes built-in frame synchronizers with media alignment to PTP/ST2059. Using the built-in synchronization capabilities of ST2110, audio and ancillary data is automatically synchronized to video on the JPEG XS decoder.

For a native ST2110 network, where uncompressed audio and video is available on the network as ST2110 elementary streams, there is no need to route audio to the JPEG XS encoder. The encoder will process the ST2110-20 video input and create a JPEG XS compressed version of that source, allowing the JPEG XS stream to be synchronized with the original source audio.

PTP timing and sync

Precision Timing Protocol (PTP) provides accurate synchronization for IP video and audio, using IEEE 1588v2 profiles or SMPTE 2059-2. Locking to PTP/TAI ensures fully synchronous operation across any network and any distance. PTP redundancy is supported with automatic bumpless PTP failover switching.

Seamless IP protection switching

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. Support for ST 2022-7 requires the protection license (Rx side only).

Reliability and protection

The software supports alarm-based input switching between different video inputs. The switches can be configured to switch either manually or automatically based on alarm severity.

Audio processing

Audio processing includes de-embedding of SDI and IP audio inputs, flexible internal routing and output embedding, as well as per-channel audio gain and delay control.

Audio delay can be adjusted on a channel-by-channel basis, up to 10 seconds. Audio level/gain can also be adjusted on a per-channel basis. The SDI embedder supports automatic re-alignment of Dolby E audio coming from SMPTE 2110-31 IP streams.

Flexible SDI interfacing via SFPs

The JPEG XS media function on HBR 10G supports HD/3G/12G-SDI via optical/electrical video SFPs or HD/3G-SDI signals via Nevion breakout cables.

Test image transmission

The JPEG XS media function can transmit an internally generated color bar or custom test image with configurable text overlays and moving patterns, to allow efficient testing of links prior to a live production.

Nevion Virtuoso JPEG XS Media Function (HBR10)

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Video formats

IP media interface	SMPTE ST 2110-20/21 (N sender, W receiver)
HD-SDI	SMPTE ST 292/ST 296/ST 274 1280 x 720p: 50/59.94/60 Hz 1920 x 1080i: 25/29.97/30 Hz 1920 x 1080p: 23.98/24/25/29.97/30 Hz 2048 x 1080p: 23.98/24/25
3G-SDI	SMPTE ST 424 (Level A)/ST 425-1 1920 x 1080p 50/59.94/60 Hz 2048 x 1080p: 47.95/48/50/59.94/60 Hz
12G-SDI	SMPTE ST 2082-10 (mode 1)/ ST 2036-1 3840 x 2160p: 50/59.94/60 Hz

SDI interfaces

SDI interfaces	12G/3G/HD-SDI Video SFP with options for: - Dual channel SDI RX (input) - Dual channel SDI TX (output) - Single channel SDI RX + SDI TX (bidirectional) - Optical and electrical variants 3G/HD-SDI video breakout with options for: - Dual channel SDI RX + SDI TX - Dual channel SDI RX with passive loop out

Video processing

Input/output video	YCbCr, 4:2:2,10 bit per component
Colour formats	ITU-R BT.709 (HDTV) ITU-R BT.2020-2 (UHDTV) ITU-R BT.2100 HDR (HLG / PQ)
Legalize / clip	Yes
Frame sync	Yes
Sync reference	PTP (IEEE 1588v2) via 10GE network interface Analog BB/TLS via Virtuoso appliance
Video delay	Yes, up to 10 frames additional delay
Test patterns	75% and 100% Bars, SMPTE RP 219, SMPTE EG 1 EIA RS-189-A, EBU TECH-3373 HDR/HLG Flat-field with configurable color Custom test image (BMP/JPG/PNG) Configurable text overlay Moving box/bar

Video compression

Video compression	JPEG XS (ISO/IEC 21122)
Compression mode	Encoding or Decoding
Channel density	Up to 3 channels of HD Up to 2 channels of UHD
Bit rate	HD: up to 350 Mbit/s for 1080i/720p HD: up to 650 Mbit/s for 1080p UHD: up to 2600 Mbit/s Compression ratio from 4:1 to 20:1 (flexible)

Audio and ancillary data formats

Embedded audio	16 channels (8 stereo pairs) Linear PCM 24-bit audio (48kHz) AES3 non-PCM audio 32-bit pass-through
Ancillary data	Pass-through SDI to/from SMPTE ST 2110-40 Single stream per SDI input/output.

Video and audio over IP transport

Unc. video	SMPTE ST 2110-20 video in RTP/UDP/IP SMPTE ST 2110-21 (N sender, W receiver)
Video over IP	JPEG XS in RTP/UDP/IP, SMPTE ST ST2110-22 CBR compressed video RTP payload format for JPEG XS (RFC 9134
Audio over IP	SMPTE ST 2110-30 PCM audio (Level A+B) SMPTE ST 2110-31 AES3 over IP (Level A+B) AES67 compliant (1 to 8 ch per stream) Up to 24 IP audio input and output flows
Ancillary over IP	SMPTE ST 2110-40 Ancillary Data over IP Up to 3 IP input or output flows
Discovery/Reg.	SDP (Session Description Protocol) NMOS IS-04/IS-05
Link redundancy	Hitless/seamless switching for all RTP flows compliant to SMPTE ST 2022-7:2019 ST2110-20: class A or C (WBUF license). ST2110-22: class C ST2110-30/31: class C

Timing and synchronization

Sync input format	PTP (IEEE 1588v2:2008) Analog BB/TLS via Virtuoso appliance
PTP profile support	PTP default and media profile SMPTE 2059-2 PTP profile
PTP redundancy	Internal PTP failover in Virtuoso FA/MI
Media timing	SMPTE ST 2059-1, SMPTE ST 2110-10 SDI video timing based on SMPTE ST 2059-1 AES67 Link Offset configuration option, or Automatic A/V sync based on RTP timestamp RTP timestamp transparent for video.

Audio / Video processing

De-embedding audio channels from SDI audio inputs
Embedding audio channels to SDI outputs
Audio routing/shuffling/processing on SDI embedder
Audio delay adjustment - up to 10 seconds per channel
Audio level/gain control - per mono channel
Automatic Dolby E realignment on SDI output
Video frame synchronization
Video delay adjustment - up to 10 frames per channel

Monitoring

Thumbnails of SDI video input and output
SDI video freeze and black frame detection (licensed)
Audio template monitoring: presence, peak and silence (licensed)

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

Accelerator requirement

Accelerator	HBR 10G Media Accelerator
Description	Multi-channel high bitrate Media Accelerator (HW module). 4x SFP+ ports that can accommodate a combination of 10GE SFP+ and video SFPs.
Product codes	VIRTUOSO-HW-HBR-SFP4 (24204)
SFP configuration	Port 1: SDI / Video SFP Port 2: SDI / Video SFP Port 3: 10GE (10GBase-R) Port 4: 10GE (10GBase-R)
Video SFP support	Non-MSA 1.5 Gb/s to 12 Gb/s HD-SDI, 3G-SDI: max 2 in + 2 out 12G-SDI: max 1 in + 1 out Optical and electrical variants
Sync input format	PTP on 10GE (IEEE 1588v2:2008, SMPTE ST2059)
Power consumption	Maximum 45W

Nevion Virtuoso JPEG XS HD (HBR25)

Video formats

IP media interface	SMPTE ST 2110-20/21 (NL sender, W receiver)
Video formats	1280 x 720p: 50/59.94/60 Hz 1920 x 1080i: 25/29.97/30 Hz 1920 x 1080p: 25/50/59.94/60 Hz 3840 x 2160p: 50/59.94/60 Hz

Video processing

Input/output video	YCbCr, 4:2:2,10 bit per component
Colour formats	ITU-R BT.709 (HDTV) ITU-R BT.2020-2 (UHDTV) ITU-R BT.2100 HDR (HLG / PQ)
Legalize / clip	Yes
Frame sync	Yes
Sync reference	PTP (IEEE 1588v2) via 25GE network interface Analog BB/TLS via Virtuoso appliance
Video delay	Yes, up to 10 frames additional delay
Test patterns	75% and 100% Bars, SMPTE RP 219, SMPTE EG 1 EIA RS-189-A, EBU TECH-3373 HDR/HLG Flat-field with configurable color Custom test image (BMP/JPG/PNG) Configurable text overlay Moving box/bar

Video compression

Video compression	JPEG XS (ISO/IEC 21122)
Compression mode	Encoding or Decoding
Channel density	Up to 4 channels of HD Up to 2 channels of UHD
Bit rate	HD: up to 350 Mbit/s for 1080i/720p HD: up to 650 Mbit/s for 1080p UHD: up to 2600 Mbit/s Compression ratio from 4:1 to 20:1 (flexible)

Video over IP transport

Unc. video	SMPTE ST 2110-20 video in RTP/UDP/IP SMPTE ST 2110-21 (NL sender, W receiver)
Compressed	JPEG XS in RTP/UDP/IP, SMPTE ST ST2110-22 CBR compressed video RTP payload format for JPEG XS (RFC 9134
NMOS support	SDP (Session Description Protocol) NMOS IS-04 Discovery and Registration NMOS IS-05 Connection Management NMOS IS-08 Channel mapping
Link redundancy	Hitless/seamless switching for all RTP flows compliant to SMPTE ST 2022-7:2019 ST2110-20: class A or C (WBUF license). ST2110-22: class C

Protection

Clean switching	Break-before-make switching (1-2 frames additional latency) Make-before-break switching
Input switching	8x video input switches. Up to 4 inputs per switch Manual or automatic switching based on alarm status and severity

Timing and synchronization

Sync input format	PTP (IEEE 1588v2:2008) Analog BB/TLS via Virtuoso appliance
PTP profile support	PTP default and media profile SMPTE 2059-2 PTP profile
PTP redundancy	Internal PTP failover in Virtuoso FA/MI
Media timing	SMPTE ST 2059-1, SMPTE ST 2110-10 SDI video timing based on SMPTE ST 2059-1 RTP timestamp generated based on PTP/ ST2110 or transparent pass-through.

Monitoring

Thumbnails of uncompressed video input and output

Media Server Appliance support

Please refer to Nevion Virtuoso Platform datasheet for details.

Virtuoso MI	Supported in version 1.4 or higher
Virtuoso RE	Supported in version 1.0.8 or higher

Accelerator requirement

Accelerator	HBR 25G Media Accelerator
Description	Multi-channel high bitrate Media Accelerator (HW module). 2x25G SFP slots. Additional licenses required for use with media adaptation/compression/ processing/ monitoring functions.
Product codes	VIRTUOSO-HW-HBR25-SFP3 (24645)
SFP configuration	Port 1: Not used Port 2: 25GE (25GBase-LR/SR) Port 3: 25GE (25GBase-LR/SR)
Sync input format	PTP (IEEE 1588v2:2008, SMPTE ST2059-2)
Power consumption	Maximum 45W

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