

INPUT SUPPORT

Live Input

- Single and Multiple Program Transport Streams (SPTS, MPTS) over UDP/IP and RTP/IP with FEC and SMPTE ST 2022-7 redundancy
- TR-01 with JPEG-2000 compression, PCM audio, and captions
- SDI (uncompressed), optional: SD-SDI, HD-SDI, 3G-SDI, Quad 3G-SDI (4K), Interleave (4K)
- Packaged network inputs: Apple HLS TS with muxed audio and video
- Video codecs:
 - H.264 up to 4:2:2 10 bit
 - H.265 up to 4:2:2 10 bit including High Dynamic Range (HDR)
 - MPEG-2
 - Apple ProRes®
 - RAW
 - JPEG-2000
- Audio codecs:
 - AC-3 (Dolby Digital)
 - EAC-3 (Dolby Digital Plus) *
 - Dolby E *
 - AAC
 - MPEG-1 Layer II
 - PCM

Live Input Redundancy

- Input integrity: Generate repeat, black, slate, or color when input is missing
- Input failover, including seamless Hot Backup up to 4K ** (dual decode, single encode)

Live Input Redundancy Trigger Conditions

- User-configurable
- Time-based errors ("Input Loss", "Video Loss", "Audio Silence", "Video Freeze", "Video Black")
- Event-based errors ("Transport Error Indicator Flag", "Continuity Counter Errors", "RTP Packet Loss")

File Input

- Containers: MXF (AS-02, OP-1a-c, OP-2a-c, OP-3c), QuickTime, MPEG-4
- Packaged files: HLS
- Discrete audio and caption inputs
- OP-47 captions from 436M track of input MXF files

File Input Features

- Separate audio and video files
- Audio delay offset
- Audio PID tracking
- Audio language tracking
- Audio track selection
- MPEG-2 deblocking
- Source file clipping
- Fast seek
- Merge multiple sources to single output
- Channel selection for multitrack inputs
- Audio only input
- Amazon S3 support
- Static image overlay per input

Multichannel Audio Input

- Per clip audio channel assignment
- Unlimited audio tracks

Timecode	<ul style="list-style-type: none">- Time code source embedded- Time code source use local system clock- Override time code date- Start encoding at specified timecode- External reference connector
Captions	<ul style="list-style-type: none">- Ancillary, DVB-Sub, SCTE-20, null, SCC, SMI, SRT, STL, Teletext, TTML, ARIB, EBU-TT-D- Source CC channel- 608 to 708 upconvert- SCTE-27 pass-through support
Ad Avail	<ul style="list-style-type: none">- ESAM- SCTE-35 splice insert- SCTE-35 with APOS- SCTE-35 Pullup- SCTE-104 digital cue tone passthrough- Ad avail blanking- Black-out capability
Nielsen	<ul style="list-style-type: none">- Nielsen ID3 certification- Nielsen RTVOD C3/C7 watermarking *
Notifications	<ul style="list-style-type: none">- Web callback- Email
Scripting	<ul style="list-style-type: none">- Pre and post processing scripts- Blank output during ad avail
608 Extended Data Services	<ul style="list-style-type: none">- Line 21 passthrough, rewrite, strip, insert
Copy and Redistribution Control Packets	<ul style="list-style-type: none">- Line 21 passthrough, rewrite, strip, insert

OUTPUT FORMATS

Video	<ul style="list-style-type: none">- H.264 (Baseline, Main, High up to 4:2:2*), 4:2:2 High Profile Intra 10 bit *- H.265 (Main, Main10 up to 4:2:2*) including HDR 10, HLG, and Dolby Vision HDR *- MPEG-2- Apple® ProRes (up to 4:2:2 10 bit)- Frame capture to JPEG (thumbnail creation)- I-frame only mode- Uncompressed
Audio	<ul style="list-style-type: none">- AAC-LC, AAC-HEV1, AAC-HEV2 (MPEG-2, MPEG-4, LATM/LOAS)- Uncompressed WAV, AIFF- AC-3 (Dolby Digital) *, AC-3 passthrough- EAC-3 (Dolby Digital Plus) *, EAC-3 passthrough- Dolby Atmos passthrough- DTS Express *- MPEG-1 Layer II- Audio only output support (TS, HLS, MSS, RTMP)
Multichannel Audio Output	<ul style="list-style-type: none">- Per clip audio channel assignment- Unlimited audio tracks

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- Multilanguage Support**
- Follow input type (ISO 639)
 - Insert audio type (ISO 639)
 - Follow language code
 - Insert language code

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- Output Locking**
- Apple HLS, Microsoft Smooth, and TS outputs

OUTPUT CONTAINERS

- Live Streaming Outputs**
- Adobe RTMP Streaming (RTMP, RTMPS)
 - Apple HTTP Adaptive Streaming (HLS)
 - Microsoft Smooth Streaming (ISMV)
 - MPEG DASH (ISOBMFF)
 - MPEG-2 Part 1, Systems, CableLabs compliant (EBIF passthrough, EBP, PSI, RAI segmentation marker) (MPEG-TS)
 - Real Time Protocol (RTP)
 - Single and Multiple Program Transport Streams (SPTS, MPTS) over UDP/IP and RTP/IP with FEC
 - Zixi push protocol

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- File Outputs**
- Apple QuickTime and ProRes (MOV)
 - Sony XDCAM MXF (XDCAM)
 - RAW YUV or RGB formats (Uncompressed)
 - MPEG-4 Part 10 (MP4)

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- Apple HTTP Adaptive Streaming (HLS)**
- TS or fMP4 segment types
 - Byte range offset
 - Single file / multiple segments
 - Segment length
 - Minimum segment length
 - Auto upload to CDN
 - Content base URL
 - Manifest base URL
 - Use subdirectories
 - Disable caching
 - Floating point manifests
 - Resolution tag
 - Compressed manifests
 - Use Pantos 7 CODEC identifiers
 - Program-Date-Time flag
 - Closed-caption tag
 - Ad markers - Adobe
 - Ad markers - Simple
 - Ad markers - SCTE-35 enhanced
 - SMPTE ST 2038 ancillary data
 - Alternate manifest destination
 - File transfer protocols (HTTP push, Akamai, Webdav) with ULL chunked transfer

- Encryption**
- AES CBC, CTR, EBC
 - Key providers - 1Mainstream, Conax, Inside Secure, Irdeto, Pikel, PlayReady, Secure media, Cisco, Verimatrix, SPEKE

- MPEG DASH (ISOBMFF)**
- Single file / multiple segments with ULL chunked transfer
 - Fragment length
 - Segment length
 - ULL chunked encoding
 - HbbTV 1.5 support
 - Base URL
 - Minimum buffer time

- Encryption**
- DASH-CENC
 - Key providers - Widevine, Pkixel, SPEKE, PlayReady

- Microsoft Smooth Streaming (ISMV)**
- Manifest level encoding (UTF-8, UTF-16)
 - Collapse identical audio streams

- Encryption**
- AES CTR
 - PlayReady support
 - Key providers - Conax, Inside Secure, Seachange, Pkixel, Irdeto, SPEKE

- Reliable TS Output**
- Deliver to AWS Elemental MediaConnect
 - Zixi push protocol

- Encryption**
- AES-128, AES-192, AES-256

SYSTEM CONTROL

- CDN**
- Integrated CDN support: Basic PUT, WebDav, and Akamai

- Load Balancing**
- Manual or automated load balancing options
 - Notifications and alerts

- Monitoring**
- System resource and statistics monitoring

- User Authentication**
- Multiple authentication tiers, Amazon S3 public and private keys

- AWS Elemental Conductor Live**
- Separate management system for control, monitoring and worker failure recovery in a multi-system configuration
 - Provision and operate channels using templates

- Network Management**
- SNMP version 2c

- Real-time Controls**
- Stop, pause and resume individual streams as well as archived files
 - Audio gain adjustment for real-time control of audio volume
 - Video and audio preview

IMAGE ENHANCEMENT

Anti-aliasing Scaling	- Reduce distortion artifacts when downscaling
Lanczos Scaling	- Multivariate interpolation
Deblocking and Denoise	- Remove common blocking and noise video artifacts
Deinterlacing	- Motion adaptive interpolation - Motion adaptive blend - Motion adaptive interpolation with ticker
Inverse Telecine	- Removes 2-3 frame format, restores original 24 fps frame rate
Telecine	- None, soft or hard
Adaptive Quantization	- Intraframe perceptual QP variation
Scene Change	- Scene change detection
Look Ahead	- Look ahead rate control
Gaming Optimizations	- Fast complexity changes and rapid quality recovery during transitions
Noise Reduction	- Noise filtering capability (Bilateral, Mean, Gaussian, Lanczos, Sharpen, Conserve, Perceptual)
Static Logo Insertion	- Up to eight static image overlays (BMP, PNG or TGA format), SDR or HDR - Apply image overlay to a single input, a single output, or globally - Specify z-order and opacity
Motion Logo Insertion	- Motion graphic overlay (HTML, MOV, PNG sequence or SWF format), SDR or HDR - Overlay HTML motion graphics generated by third party authoring tools. Switch overlays on or off with SCTE-35 signals. - Using SWF and Adobe® ActionScript® code, manipulate the video for effects such as squeezeback
Thumbnail Creation	- Create thumbnail JPEG images for any single frame or at custom intervals
Color Correction	- Brightness, contrast, hue, saturation - Full swing range or passthrough - 601, 709 color space conversion - HDR to SDR down conversion
MPEG-2 Error Concealment	- Temporal pixel substitution
Cropping	- Select pixel locations to crop
Timecode Burn In	- Text, font size, position

AUDIO ENHANCEMENT

Level Adjustment	- Volume control
Audio Loudness Management	- Audio loudness monitoring and correction; results stored to file (CALM compliant) *
Channel Mixing and Mapping	- Manual audio remixing - Broadcaster mixed AD

Rate Conversion	- Adjust audio sample rate and frequency
Formats	- Encode multiple formats simultaneously
Multiple Audio Tracks	- Support for multiple audio streams for each video stream (SAP)

OTHER FEATURES

Metadata	- VBI passthrough (V-Chip, CGMS-A) - KLV Data
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Caption Extraction and Passthrough	- Inputs: <ul style="list-style-type: none">• Embedded• SCC• Teletext - Transcaption Outputs: <ul style="list-style-type: none">• CFF-TT• DVB-sub• Embedded• Embedded+SCTE-20• SCTE-20+Embedded• SCC• SMI• SMPTE-TT• SRT• Teletext• TTML• WebVTT - Open caption support - Caption burn in - Language flag insertion
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Processing	- Rate control <ul style="list-style-type: none">• CBR encoding• QVBR (Quality-Defined Variable Bitrate) encoding• VBR encoding• Statmux encoding * - Insert / respond to AFD - Scene change detect - Minimum I-frame interval - Force interlace mode - Variable GOP support - Content-adaptive B frames - HDR 10 support (ST.2084, ST.2086, MaxFALL, MaxCLL) - HLG (Hybrid Log Gamma) BT.2020 - Dolby Vision (Profile 5 and Profile 8.1) * - Conversion between SDR, HDR 10, and HLG - Rec.2020 color support - RTMP metadata insertion - EBIF passthrough - EBP, PSI, RAI segmentation marker
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* Available with Optional License

** Hardware Dependent