

Electra[®] X

ADVANCED MEDIA PROCESSOR



The Harmonic Electra[®] X advanced media processor is the industry's first fully converged solution for broadcast and OTT delivery of SD and HD content.

Featuring real-time encoding and integrated, high-quality branding and graphics, Electra X offers programmers and service providers market-leading video quality, unparalleled function integration and increased operational flexibility and scalability.

Electra X is available in several deployment models for a perfect fit with infrastructure requirements, including a server with Electra X2, a virtual machine with XVM and a baremetal installation with Electra X Docker.

At the heart of Electra X is the Harmonic PURE Compression Engine™, an advanced encoding technology that supports SD and HD formats and MPEG-2, MPEG-4 AVC and HEVC codecs for broadcast and over-the-top multiscreen delivery. Originally developed for our VOS® cloud-native media processing platform, the Harmonic PURE Compression Engine powers Electra X with superior video quality at minimum bandwidth. Users can also employ EyeQ™ real-time video optimization, Harmonic's enhancement for PURE Compression that ensures delivery of the highest video quality across IPTV or OTT delivery networks while reducing bandwidth consumption by up to 50%.

Harmonic's industry-leading Intelligent Function Integration™ achieves its highest level to date in Electra X2. On-board video graphics and branding bring new levels of workflow efficiency to the video delivery chain, a capability that also preserves video quality by removing the need to inject baseband components into the IP workflow. Rich audio functionality includes encoding in Dolby®AC-4 and Dolby Digital Plus (E-AC-3) and integrated audio leveling.

As a next-generation media processing system, Electra X offers a new approach to encoding. Uncompressed video over IP workflows are supported with optional SMPTE ST 2022-6 or SMPTE ST 2110 ingest. High dynamic range (HDR) content is supported. Dynamic ad insertion (DAI) is also available. Electra X features comprehensive subtitling capabilities with Teletext or SCTE 27 conversion to DVB subtitling, ARIB and China Closed caption. With its superior video quality, function integration, bandwidth efficiency and workflow flexibility, this multi-service, multi-codec, multi-function platform is sure to simplify your infrastructure, reduce costs and drive new revenue-generating services.

Business Benefits

Reduced CAPEX and OPEX

The broad capabilities of the Electra X media processor converge broadcast and multiscreen encoding and delivery into a compact deployment. This remarkable function integration reduces the number of devices required to build out a broadcast transmission chain, saving on both capital and operating expenditures and delivering exceptionally low total cost of ownership (TCO).

HIGHLIGHTS

- SD/HD MPEG-2, MPEG-4 AVC and HEVC encoding for broadcast and OTT multiscreen services
- Harmonic PURE Compression Engine and EyeQ technologies for market-leading video quality at the lowest bitrates
- Integrated video graphics and branding, without custom authoring tools or training
- Optimized statistical multiplexing over IP
- Broadcast-grade up-conversion
- Teletext to DVB sub-conversion
- Rich audio functionality, including AC-4, E-AC-3 encoding and Jünger Level Magic audio level adjustment
- Optional SMPTE ST 2022-6 or SMPTE ST 2110 support for uncompressed video over IP
- HDR signaling

Simplified workflows

With Electra X, encoding, graphics and branding operations are controlled from a single interface. Reducing the number of discrete boxes in the broadcast chain reduces network complexity, resulting in an operation that is easier to set up, manage and maintain.

IP infrastructures can be streamlined thanks to powerful quad input redundancy capability.

Accelerated revenue generation

The integrated multi-function capabilities of Electra X add unmatched flexibility and efficiency to your operation; they also accelerate your ability to launch new revenue-generating services, such as over-the-top (OTT) streaming of live and time-shifted content, and the broadcasting of new HD channels. Support for DAI, as well as integration with leading third-party systems such as Sky AdSmart, provide additional opportunities to grow your business.

Brand reinforcement

With its onboard graphic capabilities, Electra X also enhances the ability to reinforce your on-air branding; for instance, by squeezing back a program's end credits while previewing an upcoming show. You can efficiently generate new revenue streams via regionalized and "double-box" advertising opportunities, in which a live feed is squeezed back into a small box while a national, regional or local advertisement runs in a larger box. A "graphic avail" can also be offered to advertisers, in which a background slate is used to convey additional or localized company information while their ad plays.

Pay as you grow scalability

Media processing capabilities on Electra X media processors are controlled through firmware licenses, assuring that you pay for only those features you need. As your business requirements change, adding new capabilities is as simple as activating a new license.

Encoding and Playout with Integrated Branding



Integrated graphics capabilities on Electra X provide the ability to monetize content in new ways, such as squeezing back a live feed to present national, regional or personalized ads.

Harmonic PURE Compression Engine



The Harmonic PURE Compression Engine enables pristine video with up to 50% better efficiency, such as when comparing HEVC to AVC.

Technical Benefits

Video compression excellence

The Harmonic PURE Compression Engine utilizes Harmonic's market-leading experience in video compression algorithms and multi-pass encoding technologies to provide superior video quality at the lowest possible bitrates and the highest density. Delivering significantly improved efficiency and simplified upgradability over competing encoder technologies, Harmonic PURE Compression also enables true codec independence. MPEG-2, MPEG-4 AVC and HEVC encoding are supported, as are the most common SD and HD content formats for broadcast, cable, satellite, IPTV and OTT delivery — including constant, variable and adaptive bitrate streaming.

For OTT and IPTV applications, Harmonic's optional EyeQ technology leverages the function of the human visual system to lower bandwidth consumption by up to 50% while ensuring the delivery of the highest video quality. Directly improving the bottom line through reduced CDN and storage costs, EyeQ delivers its bandwidth savings using a standard AVC codec and with no requirement to upgrade client devices. The technology ensures that video quality is optimized, that buffering is reduced, and that your viewers' quality of experience is improved.

Preprocessing

Advanced noise-reduction capabilities include Harmonic's signature motion-compensated temporal filtering (MCTF) to enhance the appearance of incoming material. Electra X processors also support powerful deinterlacing to cleanly deliver progressive formats.

High-quality graphics and branding

Electra X possesses a unique set of graphics and branding capabilities tailored to the requirements of content distribution and service delivery. Dynamic text, regulatory and station logos, and rich branding elements can be easily added to video channels. Up to eight graphics layers are supported, and graphics elements can be shared across all distribution channels, including mobile devices and the web. Advanced digital video effects, including squeezeback with dynamic text insertion, full slate insertion, and independent branding on each channel, enable the creation of sophisticated on-air looks — and add the ability to monetize second screens.

Statmux over IP

The Electra X processor maximizes the efficiency and flexibility of statistical multiplexing through tight integration with the Harmonic ProStream® X IP video stream processor and gateway, and DiviTrackIP™ statmux technology. DiviTrackIP connects remote Electra X encoders with ProStream X systems across a LAN or WAN, allowing any ProStream X in the network to efficiently manage the encoders' statmux pools. ProStream X also supports regional statmux capability for the terrestrial market, allowing a single Electra X instance to be part of multiple DiviTrackIP pools. Channels can be controlled in a statmux pool by setting a priority for each one.

SD-to-HD up-conversion

Featuring integrated broadcast-quality up-conversion, Electra X media processors are ideally suited for applications such as HD simulcast of an existing SD channel lineup.

Audio processing

Electra X processors support embedded audio and can natively encode AC-3, E-AC-3, AAC and HE-AAC, all available via firmware license. Integrated Jünger Level Magic™ enables compliance with the CALM Act by automatically eliminating audio level changes both within a channel and when switching from one channel to another.

Powerful control

Electra X processors are managed via Harmonic's NMX™ Digital Service Manager, a definitive video network management solution encompassing a powerful set of tools for monitoring and managing compressed digital media services. When paired with other NMX-controlled systems, such as Harmonic's ProStream X stream processor and ProMedia® X Origin multiscreen media server, Electra X becomes part of a highly scalable, software-based solution for the deployment of linear broadcast and OTT video services.

Rock-solid stability

The Electra X server deployment version Electra X2 is built on the same proven Linux OS that powers Harmonic Spectrum media servers, the industry's most trusted server platform. Redundant power supplies and fans further enhance system reliability. This rock-solid foundation provides broadcasters and service providers with the peace of mind demanded for mission-critical operations where system downtime is not an option.

World-class service and support

Harmonic stands behind Electra X media processors with comprehensive service and support programs, including system design, service deployment, technical support and network maintenance. World-class service plans and a global network of flexible and responsive support professionals help ensure your ability to deliver outstanding "anytime, anywhere, any-device" customer experiences.

ELECTRA X FEATURES SPECIFICATIONS

(contact Harmonic for availability)

INPUT/OUTPUT

Transport Stream	
3G/HD/SD-SDI Ingest	(For Electra X2 server)
SMPTE ST 2022-6 Ingest	
SMPTE ST 2110 Ingest	

DECODING

Video (4:2:0/4:2:2)	MPEG-2, MPEG-4 AVC, HEVC Main 10 (4:2:0 only) Up to 1080p @ 59.94
Audio	MPEG-1 Layer II, AC-3, E-AC-3, Dolby E, HE-AAC Mono, stereo, multichannel

BROADCAST VIDEO PROCESSING

Codecs	MPEG-2 MP @ ML MPEG-2 MP @ HL MPEG-4 AVC MP @ L3 MPEG-4 AVC HP @ L4 HEVC Main 10
SD Resolutions and Frame Rates	576i @ 25 480i @ 29.97
HD Resolutions and Frame Rates	720p @ 50 and 59.94 1080i @ 25 and 29.97 1080p @ 24, 50 and 59.94
Up/Down/Cross-Conversion	480i @ 29.97, 720p @ 59.94, and 1080i @ 29.97 576i @ 25, 720p @ 50, and 1080i @ 25 720p @ 59.94 and 1080i @ 29.97 or 1080i @ 29.97 and 720p @ 59.94 Thumbnails
Processing Capabilities	Scene-cut and fade/dissolve detection Dynamic GOP management with adaptive I-frame insertion CBR, VBR (DToIP statmux with ProStream X)
Video Pre-Processing	Hierarchical LookAhead™ Motion-compensated temporal filtering (MCTF) Horizontal filter
HDR	HLG and HDR10

MULTISCREEN VIDEO PROCESSING

Codecs	AVC (H.264) Main, Baseline HEVC Main 10
Video Optimization	Harmonic EyeQ
Container	TS over UDP, each video delivered as a separate SPTS
Aspect Ratio Handling	4:3, 16:9

AUDIO PROCESSING

Codecs	MPEG-1 Layer II (stereo) AC-3, E-AC-3, AC-4, MPEG-2/4 AAC LC (ADTS/LATM), MPEG-4 HE-AAC v1/2 (ADTS/LATM) (stereo and 5.1 surround)
Input	Embedded or TS
Level Control	Jünger Level Magic audio level adjustment
Watermarking	Nielsen
Audio Description	Receiver mix

ANCILLARY DATA SPECIFICATION

Closed Captions	EIA-608 EIA 708 ATSC A/53 608/708 conversion option
VANC Data	Teletext WSS AFD VITC
Digital Program Insertion (DPI)	SCTE 104 over Ethernet SCTE 104/VANC to SCTE 35

SYSTEM MANAGEMENT

Harmonic NMX™ Digital Service Manager

GRAPHICS & BRANDING

Adobe Creative Suite compatibility
Integrated DVE
Independent branding for each service
Up to 8 layers of graphics
Logo insertion
Support for all standard image formats (PNG, JPG, TIFF, GIF), sequences (Targa, FLV) and typefaces

ELECTRA X2 SERVER SPECIFICATIONS

INPUT/OUTPUT

Connectors	Two dedicated TS inputs Two dedicated TS outputs Two dedicated management ports
3G/HD/SD-SDI Ingest	Eight or 16 mini-DIN ports (optional)
SMPTE ST 2022-6 Ingest	Optional

POWER

Power Supply	Dual, hot-swappable from rear	
Input Voltage Range	90-264 VAC	
Input Frequency Range	47-63 Hz	
Power Consumption		
Platform	Typical	Max
ELC-X2-G2-AC-GG	380 W	490 W
ELC-X2-G2-AC-GG-S	400 W	510 W
ELC-X2-G2-AC-GG-SS	410 W	530 W
ELC-X2-G2-AC-GG-Y	390 W	500 W

PHYSICAL

Dimensions (W x H x D)	17.67 in x 1.7 in x 27.75 in (1 RU) 44.9 cm x 4.32 cm x 70.5 cm
Weight	36 lbs/16.33 kg

ENVIRONMENTAL

Cooling	Front to rear airflow Temperature-controlled fans
Operating Temperature	+32° to +95° F 0° to +35° C
Storage Temperature	-40° to +158° F -40° to +70° C
Operating Humidity	<95% non-condensing
Safety	IEC/EN 60950-1 CAN/CSA-C22.2 No. 60950-1 BIS IS13252 (Part 1):2010 NOM-19-SCFI-1998
Electromagnetic Compatibility	EN55022:2010 EN55024:2010 ICES-003, Issue 5:2012, Class A 47 CFR, FCC Part 15, Subpart B, Class A AS/NZS CISPR22 KN 22 and KN 24 VCCI V-3/2011

ORDERING INFORMATION

ELC-X2-G2-AC-C	Electra X2 advanced compression platform with C G2 CPU and dual hot-swap AC power supplies
ELC-X2-G2-AC-C-S	Electra X2 advanced compression platform with C G2 CPU, 8-port SDI module and dual hot-swap AC power supplies
ELC-X2-G2-AC-GG	Electra X2 advanced compression platform with GG G2 CPU and dual hot-swap AC power supplies
ELC-X2-G2-AC-GG-S	Electra X2 advanced compression platform with GG G2 CPU, 8-port SDI module and dual hot-swap AC power supplies
ELC-X2-G2-AC-GG-SS	Electra X2 advanced compression platform with GG G2 CPU, dual 8-port SDI modules and dual hot-swap AC power supplies
ELC-X2-G2-AC-GG-Y	Electra X2 advanced compression platform with GG G2 CPU, dual-port 10-GbE module and dual hot-swap AC power supplies



Electra X

Electra[®] X2S

ADVANCED MEDIA PROCESSOR



The Harmonic Electra[®] X2S advanced media processor converges the essential components of a video headend onto a cost-effective 1-RU platform.

Featuring integrated real-time encoding, network management, multiplexing, and high-quality graphics and branding, Electra X2S offers broadcasters, pay-TV operators and content providers market-leading video quality, unparalleled function integration and increased operational flexibility.

At the heart of Electra X2S is the Harmonic PURE Compression Engine™, an advanced encoding technology that supports SD and HD formats, and MPEG-2, MPEG-4 AVC and HEVC codecs for broadcast and OTT multiscreen delivery. The Harmonic PURE Compression Engine powers Electra X2S with superior video quality at minimum bandwidth. Users can also employ EyeQ™ real-time video optimization, Harmonic's optional enhancement for PURE Compression that ensures delivery of the highest video quality across IPTV or OTT delivery networks while reducing bandwidth consumption by up to 50%.

Harmonic's industry-leading function integration achieves its highest level in Electra X2S. Statistical multiplexing capabilities previously available only on Harmonic ProStream® stream processors, and management functionality from the Harmonic NMX™ Digital Service Manager™ come standard. The addition of on-board video graphics and branding bring new levels of workflow efficiency to the video delivery chain, a capability that also preserves video quality by removing the need to inject baseband components into the IP workflow. Rich audio functionality includes encoding of Dolby® Digital Plus (E-AC-3) content and integrated audio leveling. Reducing the number of discrete boxes in the broadcast chain reduces network complexity, resulting in an operation that is easier to set up, manage and maintain.

The Electra X2S processor maximizes the efficiency and flexibility of multiplexing by integrating Harmonic Flexstream™ IP (formerly DiviTrackIP™) statmux technology in the same chassis as the encoder. Unique capabilities include support for distributed statmuxing and Flexstream Convergence, in which a target average bitrate can be set for each service within a statmux pool. Especially useful for broadcasters with Channel Sharing Agreements, Flexstream Convergence enables bandwidth savings over a specified period of time while maintaining high video quality.

Easy to use, the Electra X2S user interface builds on NMX to offer a powerful set of tools for monitoring and managing compressed digital video and audio systems. Service status, including alarms, is passed through to the top level, ensuring that problems are quickly detected and resolved. Adding, reconfiguring or removing services or equipment is fast, easy and error-free. Templating, wizards, consolidated data views and powerful cut-and-paste functions are also available for both service and system modifications.

As a next-generation media processing system, Electra X2S offers a new approach to video distribution and delivery workflows. With its industry-leading video quality, function integration, bandwidth efficiency and workflow flexibility, this multi-service, multi-codec, multi-function "headend-in-a-box" reduces the number of devices required to build out a broadcast transmission chain, saving on both CAPEX and OPEX, and delivering exceptionally low total cost of ownership (TCO). The integrated capabilities of Electra X2S also accelerate your ability to quickly launch revenue-generating services, such as new HD channels and OTT channels featuring live and time-shifted content.

HIGHLIGHTS

- SD/HD MPEG-2, MPEG-4 AVC and HEVC encoding for broadcast and OTT multiscreen services
- Harmonic PURE Compression Engine and EyeQ technologies for market-leading video quality at the lowest bitrates
- Flexstream IP statistical multiplexing, including the ability to set target bitrates for each program in a pool
- Broadcast-grade up-conversion
- Slate insertion for service disruption messages
- Rich audio functionality, including AC-4, E-AC-3 encoding and Jünger Level Magic audio level adjustment
- SCTE 27 or Teletext to DVB subtitling

SPECIFICATIONS

INPUT/OUTPUT

Connectors	Two dedicated TS inputs Two dedicated TS outputs Two dedicated management ports
3G/HD/SD-SDI Input	3G/HD/SD-SDI Input Eight or Sixteen Mini DIN ports (optional)
ASI output	Eight Mini DIN ports

DECODING

Video (4:2:0/4:2:2)	MPEG-2, MPEG-4 AVC Up to 1080p @ 59.94
Audio	MPEG-1 Layer II, AC-3, E-AC-3, Dolby E, HE-AAC Mono, stereo, multichannel

BROADCAST VIDEO PROCESSING

Codecs	MPEG-2 MP @ ML MPEG-2 MP @ HL MPEG-4 AVC MP @ L3 MPEG-4 AVC HP @ L4 HEVC Main 10
SD Resolutions and Frame Rates	576i @ 25 480i @ 29.97
HD Resolutions and Frame Rates	720p @ 50 and 59.94 1080i @ 25 and 29.97 1080p @ 24, 50 and 59.94
Up/Down/Cross-Conversion	480i @ 29.97, 720p @ 59.94, and 1080i @ 29.97 576i @ 25, 720p @ 50, and 1080i @ 25 720p @ 59.94 and 1080i @ 29.97 or 1080i @ 29.97 and 720p @ 59.94
Processing Capabilities	Scene-cut and fade/dissolve detection Dynamic GOP management with adaptive I-frame insertion CBR, VBR (DTolP statmux with ProStream 9100)
Video Pre-Processing	Hierarchical LookAhead™ Motion-compensated temporal filtering (MCTF) Horizontal filter

MULTISCREEN VIDEO PROCESSING

Codecs	AVC (H.264) Main, Baseline HEVC Main 10
Video Optimization	Harmonic EyeQ
Container	TS over UDP, each video delivered as a separate SPTS
Aspect Ratio Handling	4:3, 16:9

AUDIO PROCESSING

Codecs	MPEG-1 Layer II (stereo) AC-3, E-AC-3, MPEG-2/4 AAC LC (ADTS/LATM), MPEG-4 HE-AAC v1/2 (ADTS/LATM) (stereo and 5.1 surround)
Input	Embedded or TS
Level Control	Jünger Level Magic audio level adjustment
Audio Watermarking	Nielsen
Audio Description	Receiver mix

ANCILLARY DATA SPECIFICATION

Closed Captions	EIA-608 EIA 708 ATSC A/53 608/708 conversion option ARIB China closed caption
VANC Data	Teletext WSS AFD VITC
Digital Program Insertion (DPI)	SCTE 104 over Ethernet SCTE 104/VANC to SCTE 35

GRAPHICS & BRANDING

Adobe Creative Suite compatibility	
Integrated DVE	
Independent branding for each service	
Up to 8 layers of graphics	
Logo insertion	
Support for all standard image formats (PNG, JPG, TIFF, GIF), sequences (Targa, FLV) and typefaces	

SYSTEM MANAGEMENT

Harmonic NMX™ Digital Service Manager	
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POWER

Power Supply	Dual, hot-swappable from rear
Input Voltage Range	90-264 VAC
Input Frequency Range	47-63 Hz
Power Consumption	400 W typical, 510 W max

PHYSICAL

Dimensions (W x H x D)	17.67 in x 1.7 in x 27.75 in (1 RU) 44.9 cm x 4.32 cm x 70.5 cm
Weight	36 lbs/16.33 kg

ENVIRONMENTAL

Cooling	Front to rear airflow Temperature-controlled fans
Operating Temperature	+32° to +95° F 0° to +35° C
Storage Temperature	-40° to +158° F -40° to +70° C
Operating Humidity	<95% non-condensing
Safety	IEC/EN 60950-1 CAN/CSA-C22.2 No. 60950-1 BIS IS13252 (Part 1):2010 NOM-19-SCFI-1998
Electromagnetic Compatibility	EN55022:2010 EN55024:2010 ICES-003, Issue 5:2012, Class A 47 CFR, FCC Part 15, Subpart B, Class A AS/NZS CISPR22 KN 22 and KN 24 VCCI V-3/2011

ORDERING INFORMATION

Part Number	Description
ELC-X2S-ATSC-IP	Electra X2S advanced compression platform for ATSC applications
ELC-X2S-DVB-IP	Electra X2S advanced compression platform for DVB applications
ELC-X2S-G2-AC-GG-S	ELC-X2S chassis, 8 SDI input, IP output
ELC-X2S-G2-AC-GG-SA	ELC-X2S chassis, 8 SDI input, ASI and IP output

Electra[®] XT

XSTREAM™ HIGH-DENSITY TRANSCODER



Possessing the highest real-time transcoding density on the market and any-to-any format support, the Harmonic Electra[®] XT Xstream™ transcoder delivers significant CAPEX and OPEX savings and accelerates time to market for operators faced with fast channel lineup growth and a rise in multiscreen applications.

Now more than ever, digital TV delivery is changing at a rapid pace, with an increasing number of channels to broadcast, more formats to support and an explosion in the range of multiscreen devices such as tablets, smartphones and connected TVs. Service providers have to tackle these challenges while continuing to increase their subscriber base, develop new web TV business and sustain average revenue per user. The Harmonic Electra XT transcoder helps operators succeed in this new paradigm.

A cost-effective appliance for live content transcoding, the Electra XT provides high-density and scalability for traditional broadcast over cable, IPTV, DTH and DTTV, as well as for multiscreen applications.

Any-To-Any Format Support

The Electra XT receives compressed video over IP streams and can transcode audio and video content from any format to any other format. For video, the device supports MPEG-2, MPEG-4 AVC and HEVC decoding and encoding in SD and HD resolutions. A wide range of audio codecs is also addressed, including MPEG-1 Layer II, Dolby[®] Digital (AC-3), Dolby Digital Plus (E-AC-3), AAC-LC and HE-AAC v1/v2 in mono, stereo and surround modes.

Highest Density & Scalability

Leveraging extensive experience and innovation in video compression algorithms, the Electra XT provides best-in-class transcoding density with up to 288 channels per platform, depending on codec and resolution. It is designed with efficiency in mind, and supports operator business growth with a modular architecture that accommodates up to nine hot-swappable audio/video processing modules. Each module can transcode a mix of channels independent of their codec (MPEG-2, MPEG-4 AVC or HEVC), resolution (HD, SD and low resolution) and frame rate (up to 60 fps) through per-channel software licensing.

The high-density benefits of the transcoder significantly reduce rack space and minimize power consumption. A flexible web-based graphical user interface facilitates the configuration and supervision of hundreds of simultaneous transcode channels.

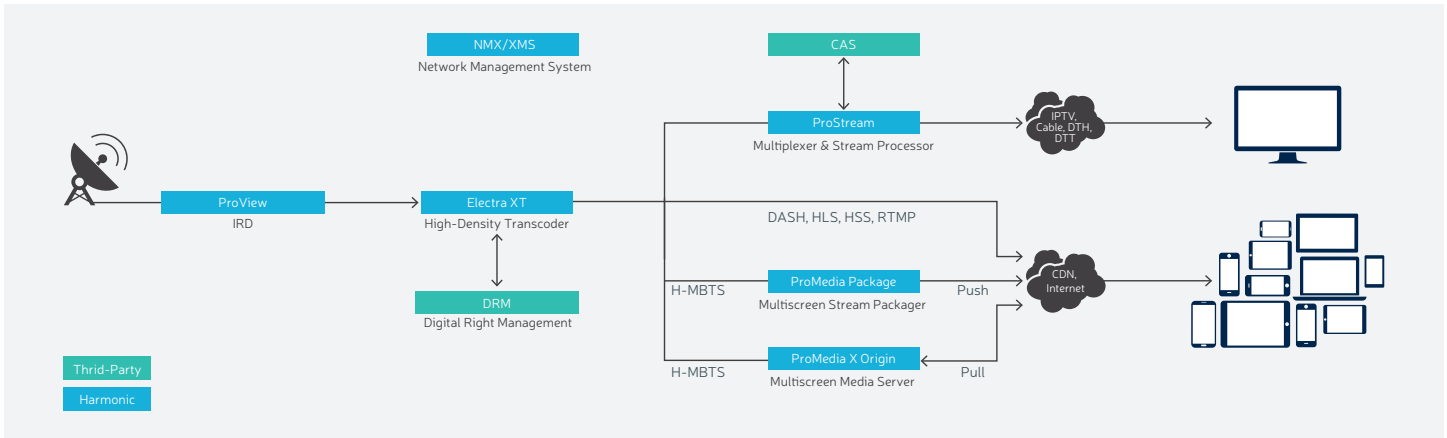
Beyond Transcoding

The Electra XT is much more than a basic high-density transcoder. To bring added value to workflows, the unit embeds efficient and advanced features, including user-defined text and logo insertion, and manual and automatic loudness control on transcoded audio channels.

For satellite, terrestrial and cable applications, the Electra XT supports internal statistical multiplexing to meet end-user demand for video quality while optimizing bandwidth. For multiscreen applications, adaptive bitrate encoding is supported. Video can be delivered to an external packager, or it can be internally scrambled and packaged in the Apple[®] HLS, Microsoft[®] Smooth Streaming and MPEG-DASH formats.

HIGHLIGHTS

- Scalable high-density live transcoding: up to 288 channels
- Any-to-any video: MPEG-2 (SD/HD), MPEG-4 AVC and HEVC (SD/HD and low-res)
- CBR, VBR, ABR, and statistical multiplexing
- SD/HD up/down-conversion
- Logo and text insertion
- Any-to-any audio
- Audio down-mixing
- Automatic loudness control
- MPEG transport stream input/output
- RTMP, HLS, HSS and MPEG-DASH outputs
- High resiliency
 - Internal failover
 - Redundant components (AC or DC PSU, fans, etc.)
 - Hot-swappable components
 - Field upgradability
- Low power footprint



Electra XT Workflow (Broadcast, IPTV and Multiscreen)

Designed for Reliability

The Electra XT is built on a highly resilient 2-RU platform equipped with hot-swappable redundant components (AC or DC PSU, fans and IP switch), minimizing service downtime in the event of a module replacement or firmware upgrade. It is powered by the Harmonic video operating system, and provides load balancing and internal failover capabilities.

World-Class Service and Support

Harmonic stands behind the Electra XT platform with comprehensive service and support programs, including system design, service deployment, technical support and network maintenance. World-class service plans and a global network of flexible and responsive support professionals help ensure your ability to deliver outstanding “anytime, anywhere, any-device” customer experiences.

SPECIFICATIONS

VIDEO INPUT/OUTPUT

Live Inputs	MPEG-2 TS over IP (RTP or UDP) Unicast and multicast IGMP v2 and v3 MPTS and SPTS CBR and VBR Adobe RTMP input
Broadcast Live Outputs	MPEG-2 TS over IP (RTP or UDP) Unicast and multicast MPTS and SPTS CBR and VBR Internal statistical multiplexing
Multiscreen Live Outputs	ABR encoding support MPEG-2 TS over IP (with EBP) Adobe RTMP Apple HLS Microsoft Smooth Streaming MPEG-DASH
Physical Interface	Integrated redundant IP switch with: 1+1 GigE ports for supervision 2+2 10GigE optical ports for media 4+4 GigE ports for media

AUDIO PROCESSING

Features	Any-to-any audio transcoding Stereo and multichannel support Audio passthrough support
Encoding Profiles	MPEG-1 Layer II AAC-LC/HE-AAC v1/v2 AC-3 E-AC-3
Decoding Profiles	MPEG-1 Layer II AAC-LC/HE-AAC v1/v2 AC-3 E-AC-3
Automatic Loudness Control	EBU R128 A-weighting
Processing Capabilities	Resampling (8-48 kHz) Stereo/mono conversion Surround down-mixing Static gain adjustment Delay adjustment

SPECIFICATIONS

VIDEO PROCESSING

Features	Any-to-any video transcoding Up to 288 channels
Encoding Profiles	
MPEG-2	MP @ ML MP @ HL
MPEG-4 AVC	BP @ L3 MP @ L3 HP @ L4
HEVC	Main
Decoding Profiles	
MPEG-2	MP @ ML MP @ HL
MPEG-4 AVC	MP @ L3 HP @ L4
HEVC	Main
Resolutions and Frame Rates	Up to 1920x1080p @ 50/60 fps Up to 1920x1080i @ 25/30 fps
Minimum Resolution	64x64 pixels
Resolution Adjustment Steps	2x2 pixels
Frame Rate Adjustment	5-60 fps
Processing Capabilities	Picture resizing (up/down) Picture cropping/clipping Aspect ratio conversion Smart deinterlacing Logo overlays Crawling text overlays
Broadcast Subtitles	DVB subtitle passthrough and burn-in Teletext passthrough Closed-caption passthrough SCTE-27 to DVB subtitles transcoding
Multiscreen Subtitles	WebVTT DFXP SMPTE-TT Configurable video/subtitles delay
Ad Insertion	SCTE 35 passthrough ESAM compliant
Multiscreen Content Protection	AES scrambling Apple HLS encryption Microsoft PlayReady® DRM

PHYSICAL

Dimensions (H x W x D)	3.5 in x 19 in x 22.8 in (2 RU) 8.8 cm x 48.3 cm x 58 cm
Weight	46.2 lbs/21 kg
Hot-Swappable Components	Dual AC or DC power supplies Fans A/V processing modules IP switches

ENVIRONMENTAL

Operating Temperature	41° to 104° F 5° to 40° C
Relative Operating Humidity	5-93% non-condensing
Storage Temperature	-40° to 185° F -40° to 85° C
Relative Storage Humidity	5-93% non-condensing

ORDERING INFORMATION

BASE SYSTEM

Part Number	Description
ELC-XT-2U-2AC-G2	Electra XT platform with dual AC PSU, IP input/output, support for up to nine A/V processing modules
ELC-XT-2U-2DC-G2	Electra XT platform with dual DC PSU, IP input/output, support for up to nine A/V processing modules

HARDWARE OPTION

Part Number	Description
ELC-XT-OPT-AVP-SKL	Audio/video processing module, supports broadcast/multiscreen transcoding for MPEG-2, MPEG-4 and HEVC (SD and HD)

VIDEO SOFTWARE LICENSES

Part Number	Description
ELC-XT-LIC-DEC-HD	One HD decoding channel (all codecs)
ELC-XT-LIC-DEC-SD	One SD decoding channel (all codecs)
ELC-XT-LIC-ENC-HD	One HD channel encoding (MPEG-2 & AVC)
ELC-XT-LIC-ENC-SD	One SD encoding channel (MPEG-2 & AVC)
ELC-XT-LIC-ENC-LR	One low-res channel encoding (AVC)
ELC-XT-LIC-ENC-HD-HEVC	One HD channel encoding (all codecs)
ELC-XT-LIC-ENC-SD-HEVC	One SD channel encoding (all codecs)
ELC-XT-LIC-ENC-LR-HEVC	One low-res channel encoding (AVC & HEVC)

AUDIO SOFTWARE LICENSES

Part Number	Description
ELC-XT-LIC-DEC-AUD20	One MPEG-1 Layer II/AAC stereo decoding channel
ELC-XT-LIC-DEC-DD20	One AC-3 or E-AC-3 stereo decoding channel
ELC-XT-LIC-DEC-AAC51	One AAC 5.1 surround decoding channel
ELC-XT-LIC-DEC-DD51	One AC-3 or E-AC-3 5.1 surround decoding channel
ELC-XT-LIC-ENC-AUD20	One MPEG-1 Layer II/AAC stereo encoding channel
ELC-XT-LIC-ENC-DD20	One AC-3 or E-AC-3 stereo encoding channel
ELC-XT-LIC-ENC-AAC51	One AAC 5.1 surround encoding channel
ELC-XT-LIC-ENC-DD51	One AC-3 or E-AC-3 5.1 surround encoding channel

FEATURE SOFTWARE LICENSES

Part Number	Description
ELC-XT-LIC-ALC20	Automatic loudness control for one audio stereo channel
ELC-XT-LIC-ALC51	Automatic loudness control for one audio surround channel
ELC-XT-LIC-FLX	Internal statistical multiplexing for one video output
ELC-XT-LIC-SCR-OTT	OTT encryption for one multiscreen output (HLS, HSS, MPEG-DASH)

XOS Advanced Media Processor

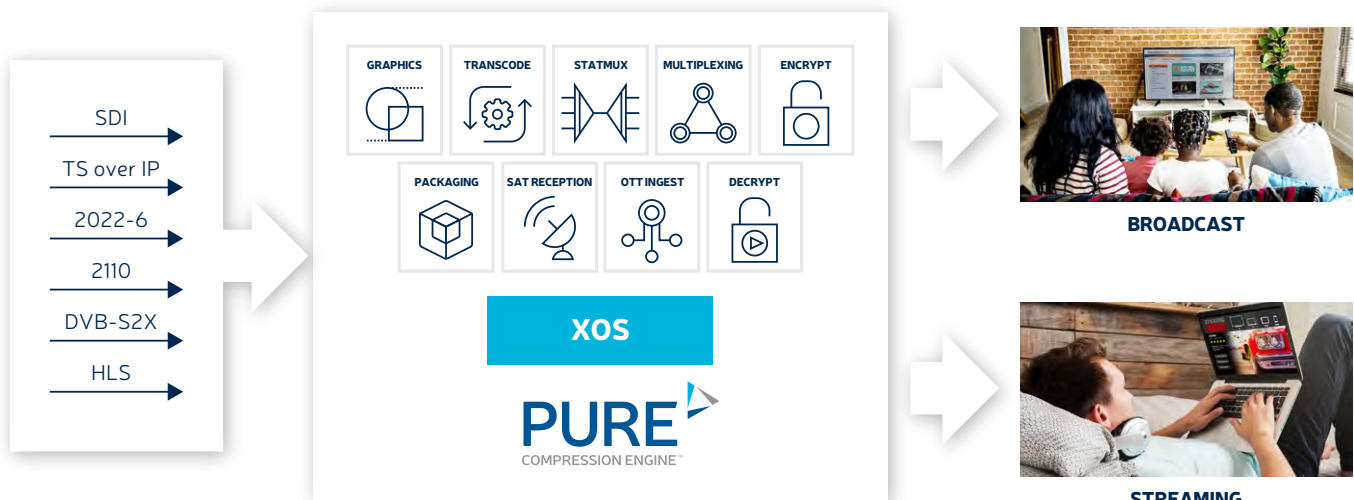


The XOS Advanced Media Processor is a high performance live media processor for broadcast and streaming applications.

Key Business Benefits

Application versatility

The XOS Advanced Media Processor is the latest generation of Harmonic software-based video appliances. XOS can be used for either broadcast or streaming applications, and is adapted to multiple deployment environments. Classic infrastructures are supported with SDI, ASI, and satellite RF interfaces. Full-IP architectures are also supported: XOS handles MPEG compressed formats, as well as the latest SMPTE ST 2022-6 and SMPTE ST 2110 standards.



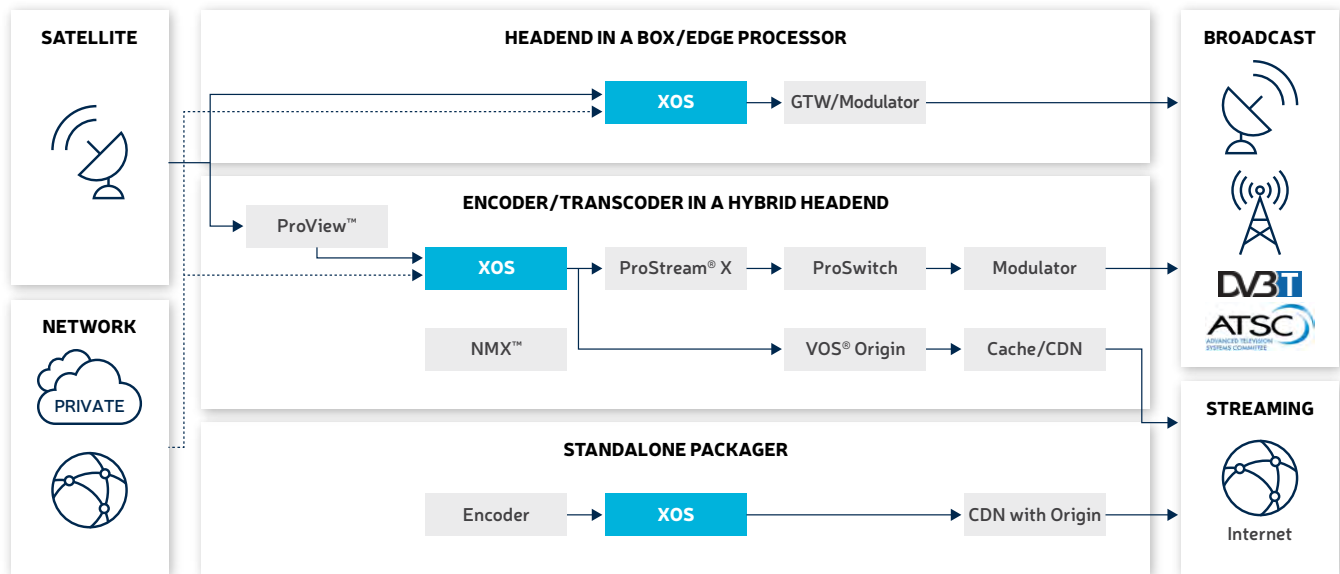
XOS Advanced Media Processor Inputs and Functionality

XOS is packed with features to address any kind of video processing application. In addition to its market-leading compression engine, XOS integrates a broad range of audio codecs, including Dolby AC-4, an advanced video pre-processing engine, a broadcast multiplexer with statmux support, and a state-of-the-art packager for streaming applications. From decoding to encoding, from HDR processing to audio loudness management, Harmonic has you covered.

Improved cost of ownership

XOS Advanced Media Processor's unparalleled function integration and performance dramatically reduce the number of appliances required for a given application, significantly improving your cost of ownership.

As a software solution, XOS is available as an appliance through the use of standard IT servers, as well as software-only Docker containers for virtualized deployments.



XOS Advanced Media Processor Workflow Examples

XOS can serve a wide range of applications and workflows with various computational needs. As such, XOS is offered pre-configured for multiple server platforms to ensure the right performance level at the right cost for your application.

Future-proof solution

The XOS Advanced Media Processor benefits from the latest microservices technology used in Harmonic Cloud and SaaS solutions.

XOS can be operated standalone thanks to its web-based user interface and it is also integrated into the Harmonic NMX™ Network Management System. In addition, XOS provides a feature-complete RESTful API, shared with other Harmonic Cloud and SaaS solutions, and enabling configuration, control, and monitoring from any external system. This greatly simplifies the implementation of hybrid systems where on-premise appliances are mixed with our Cloud solutions, resulting in maximum simplicity and flexibility.

Unique Features

Premium video compression

Powered by Harmonic PURE™ Compression Engine, the XOS Advanced Media Processor delivers excellent picture quality at any bitrate while optimizing CPU power consumption. XOS lowers video bitrates by using AI-based algorithms implemented for all video codecs including MPEG-2, AVC, and HEVC.

Flawless UHD

The XOS Advanced Media Processor supports multiple UHD 10-bit transcoding in a single 1-RU server. It also supports SD and HD encoding for multi-profile encoding applications. XOS performs statistical multiplexing for optimal bandwidth usage on cable, terrestrial, and satellite networks.

XOS simplifies conversions between SDR and different HDR formats and color spaces, including HDR10, HLG, BT.709, and BT.2020. It also feeds legacy networks requiring SDR from a HDR source. In addition, XOS maintains a constant output SDR/HDR format from sources with various dynamic ranges.

Innovative streaming

The XOS Advanced Media Processor uses EyeQ™ technology, which can reduce your streaming delivery costs by up to 50%, while improving viewer quality-of-experience. Harmonic EyeQ™ content-aware encoding is fully compatible with standard protocols and players. XOS simplifies streaming architectures with its built-in low-latency push packager that supports DASH and fragmented HLS, to reach standard broadcast latencies in streaming applications (CMAF).

Perfect Edge processor

With its numerous features and wide range of interfaces, the XOS Advanced Media Processor is the perfect choice for small Headends (where everything needs to be contained in a single box) and for Edge transcoding applications. The XOS Advanced Media Processor connects directly to both Cloud and Satellite networks.

XOS Advanced Media Processor



SPECIFICATIONS

VIDEO INPUT/OUTPUTS

Live Inputs	SDI (SD/HD/3G, UHD as 4 quadrant or 2SI) MPEG-2 TS over IP HLS SMPTE 2022-6 SMPTE 2110 DVB-S2X IGMP v2/v3 Advanced Source Redundancy with 2022-7 support
Broadcast Live Outputs	MPEG-2 TS over IP (2022-7 compliant) ASI Outputs MPTS and SPTS Standalone Statmux Remote Statmux compatible with Electra X2/XVM and ProStream X/9000
Streaming Outputs	Synchronized ABR Encoding MPEG-2 TS over IP (ATS with EBP) Apple® HLS Microsoft Smooth Streaming (MSS) MPEG DASH RTMP/RTMPS

VIDEO PROCESSING

Features	Broadcast & Mobile/Web Encoding Content-aware Encoding with EyeQ™
Encoding Profiles MPEG-2	MP@ML MP@HL BP@L3
MPEG-4 AVC	MP@L3 HP@L4
HEVC	High 4:2:2 @ L4.1 Main@L5.1 (main tier) Main 10@ L5.1 (main tier)
Decoding Profiles AVS+ AVS2 MPEG-2	HD UHD MP@ML MP@HL
MPEG-4 AVC	MP@L3 HP@L4
HEVC	High 422@L4.1 Main @L5.1 up to 100 Mbps Main 10 @L5.1 up to 100 Mbps
Sony LLVC	HD UHD
Resolutions and Frame Rates Frame Rate Adjustment	Up to 3840x2160p @50/60 fps Up to 1920x1080i @25/30 fps 1-60 fps
Processing Capabilities	Picture Resizing (Up/Down) Smart De-interlacing Noise Reduction Logo and Slate Overlays Video Watermarking Frame Rate Conversion PIP Encoding
HDR & WCG Capabilities	HDR Signaling: HDR10, HLG, Dolby Vision, and SL-HDR1 WCG Signaling: BT.2020, BT.709, and BT.601 Tone Mapping (HDR10/HLG → SDR) Tone Expansion (SDR → HDR10/HLG) Dynamic HDR Metadata Generation

AUDIO PROCESSING

Features	Any-to-Any Audio Transcoding Stereo and Multi-Channel Support
Encoding Profiles	MPEG-1 Layer II AAC-LC/HE-AAC v1/v2 AC-3 (Dolby Digital®) E-AC-3 (Dolby Digital Plus™) Dolby AC-4
Decoding Profiles	MPEG-1 Layer II AAC-LC/HE-AAC v1/v2 AC-3 E-AC-3 Dolby E with Auto Switch
Processing Capabilities	Automatic Loudness Control (EBU R 128, A-weighted, K-weighted) Audio Pass-Through including Dolby ATMOS Nielsen Audio Watermarking Resampling Stereo/Mono Conversion Surround Down Mixing Static Gain Adjustment Delay Adjustment

DATA FEATURES

VANC Processing	Teletext (OP-47/SMPTE-2031) CEA-608/708 DVB Subtitles Passthrough and Burn-in ARIB SMPTE-2038 SCTE-35/SCTE-104 VITC WSS/AFD
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PACKAGING FEATURES

Ad Insertion	Conversion to SCTE-35 Annotations
Audio, Data, and Video Selection	Exclusion of services per packaging technology
Segmented Media Formats	HLS-TS, CMAF, DASH, MSS
Protocols	WebDAV, HTTP Post, RTMP/RTMPS
Closed Captions and Subtitles	CEA-608/708 Passthrough CEA-608/708 to WebVTT (HLS, DASH) and TTML (HSS) Teletext or Cavena P31 to WebVTT (HLS, DASH) or TTML (HSS) DVB Subtitle Conversion to SMPTE-TT (OCR)
DRM	Multi-Key Encryption CPIX API ATSC 3.0 Compatible

MANAGEMENT

User Interfaces	Harmonic NMX™ Network Management System Standalone Web-based Interface
API	RESTful API shared with VOS® SNMP ESAM (decision on SCTE-35 processing)
In-band Control	From Input TS via DMS™ Management System
Redundancy	Unit Based 1+1 N+M

DEPLOYMENT OPTIONS

Appliances	1-RU server, various models depending on requested processing capacity: <ul style="list-style-type: none">• XOS Model Small• XOS Model Medium• XOS Model Large Input/outputs via optional cards: <ul style="list-style-type: none">• Up to 16 3G-SDI• Up to 8 GB Ethernet interfaces• Up to Dual 25GB interfaces• Up to 8 DVB-S2X inputs• Up to 4 ASI outputs
Software Applications	Compatible with COTS servers Available as bare metal, VM, and Docker containers

ProStream X

VIDEO STREAM PROCESSOR & GATEWAY



The Harmonic ProStream® X software-based stream processing and gateway provides the best-in-class, high-performance stream processing for mission-critical broadcast, cable, satellite, terrestrial, IPTV, and OTT delivery applications. Benefit from a variety of advanced video processing capabilities, including multiplexing, scrambling, splicing, and blackout switching.

As the successor to the market-leading ProStream 9100 stream processor, the software-based ProStream X system allows users to leverage the versatility and agility of software-based infrastructure. The platform integrates 10Gbps throughput with a variety of advanced video processing applications, including multiplexing, splicing, blackout switching, and DVB CSA3 encryption. ProStream X also serves as a high-throughput video gateway featuring socket address flipping and ASI-to-IP conversion.

On top of the high throughput and remultiplexing, ProStream X can be used as a DVB-T2 gateway. ProStream X is capable to encapsulate a multiplex into a DVB T2-MI stream, providing signalization, transmission, and synchronization parameters to DVB-T2 modulators. It also has the capability to apply DVB-T MIP insertion which inserts synchronization marks in the DVB-T transport stream.

ProStream X runs on a 1-RU COTS HPE® server and pairs with the Harmonic Electra® X2 advanced media processor to deliver a compact solution for encoding and distributing superior-quality IP and ASI video streams. This high-density architecture reduces the amount of rack space required to meet fluctuating stream processing requirements, helping operators reduce CAPEX and OPEX. High reliability and simplified serviceability result in an all-in-one-box experience for high-throughput stream processing at low TCO.

SD, HD, and UHD formats, and MPEG-2, MPEG-4 AVC, and HEVC codecs are all supported on ProStream X. This appliance is available in several deployment models for a perfect fit with infrastructure requirements, including a server with ProStream X, a virtual machine with XVM, and a baremetal installation with ProStream Docker.

Business Benefits

Scrambling

ProStream X integrates with major conditional access systems (CAS) and is the first stream processor to offer 128-bit DVB CSA3 encryption support, integrated and certified by Cisco and Irdeto, making it the most secure stream processing solution for distributing UHD broadcast services. DVB CSA2, AES, and BISS fixed key scrambling are also supported, as well as trick mode for video on demand.

ProStream scrambling technology is known in the industry for its stability and high performance. The ProStream X platform can scramble any format of video, audio and data elementary stream (e.g., MPEG-2, MPEG-4 AVC, HEVC, AC-3, AAC, HE-AAC), as well as multiplex MPEG TS. The solution easily integrates into existing architectures and reduces cost and complexity by eliminating the need for multiple devices in distributed cable, satellite, or telecom networks.

Statistical Multiplexing

Harmonic's DiviTrackIPTM option integrates statistical multiplexing and IP switching by connecting ProStream X systems with remote Harmonic Electra X2 encoders across a LAN or WAN, allowing any ProStream X in the network to efficiently manage the encoders' statmux pools. ProStream X also supports regional statmux capability for the terrestrial market, allowing a single encoding instance to be part of multiple DiviTrack IP pools. This capability answers the need to encode and generate regionalized TS's with both common (shared) national and unique regional channels. The use of the regional statmux feature reduces the number of encoders required to support regionalized feeds and eliminates unnecessary national common program duplication.

HIGHLIGHTS

- Multiplexing and scrambling of up to 2,000 simultaneous broadcast services
- High-throughput 10Gbps video gateway
- Advanced multiplexing of any service from any input to any output
- Target Average Bitrate
- DataTrack
- IP networking and mirroring
- DiviTrack IP statistical multiplexing with remote distributed encoders
- Live-to-live splicing for MPEG-2, MPEG-4 AVC, and HEVC video streams
- DVB CSA3, DVB CSA2, and AES scrambling
- Slate insertion for service disruption messages
- Emergency Alert System (EAS) compliance including SCTE-18 Trigger

In addition, ProStream X enhances statmux with DataTrack capability, which allows non-video PIDs (e.g: audio, ancillary data, teletext, subtitling) into the statmux pool. When not in use, the ProStream X statmux mechanism, frees up the bandwidth provisioned for these PIDs, allowing it to be reallocated to video to improve video quality. The DataTrack capability is valid also in CBR systems where no advanced allocation is required anymore for these occasional PIDs without risking of an overflow.

ProStream statmux also includes a unique Target Average Bitrate application, which provides the ability to apply the long-term average bitrate for each video based on the user configured bitrate. For operators that have multiple customers sharing channels in the same statmux pool, the feature will secure the average bitrate customers are paying for, over the long term, while maintaining high video quality.

Linear Ad Splicing

Linear ad splicing, or digital program insertion, on ProStream X enables the GOP-accurate insertion of local and regional ads directly into live-to-air MPEG-2, MPEG-4 AVC, and HEVC SD/HD transport streams. With this capability, broadcasters and service providers can increase average revenue per user by offering their advertisers the ability to reach differentiated viewers with targeted ads.

The powerful capability enables broadcasters to implement advanced advertising capabilities for hundreds of channels without needing to purchase a standalone, box-level splicing solution, saving costs while simultaneously opening up new revenue streams. In addition, by eliminating the need to decode signals to insert ads, workflows are optimized, and video quality is maintained at the highest possible level.

ProStream X supports live-to-live splicing, which allows ProStream X to switch between main and alternative live feeds seamlessly, with no ETR 290 errors at output. In statmux applications that include switchover to an alternate program, the alternate programs become part of the statmux VBR pool.

Digital Turnaround

With standard IP and DVB input and output interfaces, the ProStream X processor is easily incorporated into existing headend environments and supports multiple digital turnaround applications. The platform’s robust, extensible, and highly scalable design supports MPEG remultiplexing, including PID remapping, prioritizing and filtering, insertion and generation of PSI/SI tables, and PID multicast. Device, port, and Input TS redundancy are supported, as well as multiple IP sockets for MPTS and SPTS applications. The compact platform not only reduces rack space and power requirements, but also simplifies network infrastructure while delivering a high-availability solution.

High-density software-based R-PHY Video Engine

When operating as part of Harmonic’s innovative CableOS vCCAP solution, ProStream X serves as a powerful Video Engine that feeds both Broadcast and VoD content to as many as 100 R-PHY devices (RPD’s) per single ProStream X server. Content may be pre-encrypted, or real-time scrambled by ProStream X.

“Pay As You Grow” Scalability

As processing needs evolve, the ProStream X platform makes it easy to incrementally add or upgrade I/O modules and firmware licenses, simplifying scalability and extending the system’s value.

Technical Benefits

High-Throughput Video Processing

ProStream X offers the choice of quad 1GbE, dual 10GbE, or ASI I/O. The high-throughput 10GbE option supports up to 1,000 transport streams and 2,000 simultaneous multiplexing and scrambling services. Video gateway capabilities include socket address flipping, ASI-to-IP conversion, and IP mirroring. The dual 10GbE interfaces also reduce the number of required router ports and enable a simplified IP addressing scheme.

High Reliability, Simplified Serviceability

Maintenance on the ProStream X platform is simplified with hot-swappable fan assemblies and dual redundant power supplies. Changing of processors and I/O modules is quick and easy. These thoughtful serviceability features improve system reliability and reduce the chance for down time, increasing the opportunity to generate revenue.

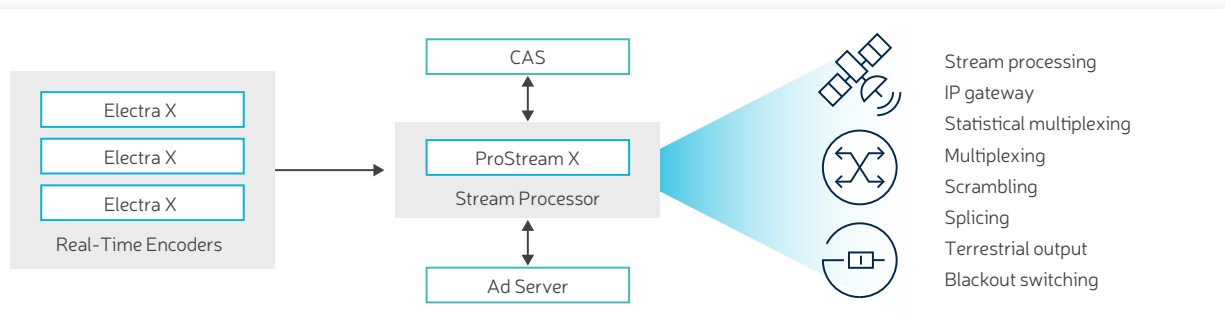
Control and Management

Processing on the ProStream X is easily configured and controlled with Harmonic’s NMXTM Digital Service Manager video management system, a service-oriented solution for mass configuring, monitoring, and automated redundancy in centralized or distributed architectures. An intuitive and user-friendly web-based GUI is also available.

World-Class Service and Support

Harmonic stands behind the ProStream X system with comprehensive service and support programs, including system design, service deployment, technical support, and network maintenance. World-class service plans and a global network of flexible and responsive support professionals help ensure your ability to deliver outstanding “anytime, anywhere, any-device” customer experiences.

ProStream X: The Heart of the Headend



SPECIFICATIONS

10GBE IP I/O

Type	IEEE 802.3z
IP Ports	Four independent
Connectors	Four 10GbE ports, RJ45 on board PCIe option cards for either two or four 10GbE ports SFP (up to three cards per platform) Support for IEEE 802.Q VLAN tagging
I/O Speed	Up to 10 Gbps
IP Encapsulation	MPEG TS over UDP/IP/MAC 1 to 7 TS/IP
MPEG Format	188 B per TS
MPEG Transport Streams	MPTS and SPTS
I/O Processing	1,000 sockets Up to 10 Gb per platform (configuration dependent)
Maximum Bitrate per Socket	300 Mbps
Addressing	Multicast
Management	IGMPv2/v3

ASI I/O

Type	ASI input/output
ASI Ports	Eight ports per card, up to three cards per platform
Connectors	Eight mini-DIN ports
I/O Direction	Configurable, input or output, per port
MPEG Format	188/204 B per TS
I/O Processing	One MPTS/SPTS per port Up to 213 Mbps per input or output

MANAGEMENT INTERFACES

Ethernet	1000Base-TX
Connectors	Two RJ45 (1 management, 1 CAS)

SCRAMBLING

SCS	Internal
Standards	DVB common scrambling Open CAS DVB CSA2, DVB CSA3, AES-CBC, AES-NSA2 scrambling AES descrambling Fix Key scrambling and descrambling
CAS connections	Simultaneous connections to 30 different CA systems
BISS Encryption	Mode 1
Number of ECMs	2,000 ECMs per platform

STATMUX CONTROL

Codecs Supported	MPEG-2, MPEG-4 AVC, HEVC
Formats Supported	SD, HD, UHD, interlaced, progressive
Frame Rates Supported	PAL, NTSC

DVB-T2 GATEWAY

Encapsulation of any generated multiplex into DVB-T2 frames
Generation of up to eight DVB T2-MI streams over ASI or IP
Interface for external PTP Server or 1 PPS/GPS
Support of single and multi-PLP

DVB-T SFN ADAPTATION

Supports MIP Insertion for an SFN network based on the DVB-T standard ETSI TS 101 191 V1.4.1 (2004-06)
Generation of up to twenty DVB-T TSs over ASI or IP
Interface for external PTP (IEEE 1588) Server or 1 PPS/GPS

REMULTIPLEXING

Routing	Any input to any output
PID	Remapping, filtering, multicasting
PID Multicasting	Any input PID can be multicasted to multiple TS outputs with different remapping and processing (different CW, if scrambled)
PSI/SI	Extraction, injection, spooling, regeneration
Output Mirroring	Any to any
Advanced Stream Processing	Linear ad-insertion splicing, SCTE-35 triggering for hundreds of channels Live-to-live splicing, Slate insertion, Blackout switching, PID range, Emergency Alarm System (EAS)

CABLEOS

Emergency Alarm System (EAS) with SCTE-18 Triggering
PTP (IEEE 1588) clock synchronization
UDP-based VoD routing, as part of CableOS solution over 1G/10G Ethernet connection
Tier-based and Session-based DVB scrambling of up to 2,000 VoD streams, as part of CableOS solution

REDUNDANCY

Device	1:1 Under NMX or stand-alone GUI management
Internal	Any-to-any input TS TS output mirroring Port redundancy Service redundancy
Triggers	ETR 290

SYSTEM MANAGEMENT

NMX™ Digital Service Manager 8.7.0 or later
Stand-alone web user interface

PHYSICAL

Dimensions (W x H x D)	17.11 in x 1.69 in x 27.83 in (1 RU) 43.46 cm x 4.29 cm x 70.7cm
Weight	35.86 lbs /16.26 kg

POWER

Power Supplies	Dual redundant
Voltage	100 V to 240 V
Line Frequency	50-60 Hz
Actual power consumption	295W without optional card

ENVIRONMENTAL

Cooling	Seven fans, hot-swappable
Operating Temperature ASHRAE Class A2	+50° to +95° F +10° to +35° C
Storage Temperature	-22° to +140° F -30° to +60° C
Safety Compliance	EN 60950-1:2006 + A1:2009 + A1:2010 + A12:2011 + A2:2013 EN 62479:2010)
Electromagnetic Compliance (Class A)	EN 55032:2012 Class A EN 55024:2010 EN 61000-3-2:2014 EN 61000-3-3:2013

ORDERING INFORMATION

PLATFORM

Part Number	Description
PRM-X-G3-AC-DD	ProStream X G3 stream processing platform with AC dual PSU
PRM-X-G3-DC-DD	ProStream X G3 stream processing platform with DC dual PSU
PRM-X-DUAL-10GBE	ProStream X G3 stream processing platform with dual-port 10GbE optical NIC with SFP+
PRM-X-OCTO-ASI	ProStream X optional ASI card, with up to eight ASI/I/O ports
LIC-PRM-X-BASE	ProStream X base license enabling basic mux function. One license only per platform. This license includes ProStream X RESTful Firmware License.
FW-PRM-X-LAB	ProStream X firmware license for lab license
FW-PRM-X-DEMO	ProStream X firmware license for all functions for 90-day demo usage; for none commercial use only
FW-PRM-X-SPARE	ProStream X cold spare firmware license for all ProStream functions; 30 days; one per chassis
FW-PRM-X-DEVICE-REDUNDANCY	ProStream X standalone device redundancy firmware license; one per chassis required

MULTIPLEXING

Part Number	Description
LIC-PRM-X-SWITCHING	Software license for ProStream X platform switching one channel. The license allows 1 video channel switching for the following switching options: EAS, EAS SCTE-18 Triggering, Blackout, BDS, ESAM, Slate Switching, and Live to live switching (service substitution). This license is limited by one platform capacity
LIC-PRM-X-ADVANCED-SM	Software license for Base ProStream XVM enabling processing. The license allows 6 video channels with Target Average Bitrate and one DataTrack (1 TS). For enabling DiviTrack statmux (per pool), a separate license should be quoted. This license is limited by one VM capacity

SCRAMBLING

Part Number	Description
LIC-PRM-X-SCRAMBLING	Software license for ProStream X platform enabling scrambling one channel. The license allows 1 video channel scrambling for the following scrambling options: DVB CSAv2, AES, EHP, Fixed key DES/SCR, BISS scrambling, selective encryption, and Pandora. This license is limited by one platform capacity
FW-PRM-X-DVB-CSAv3-CW	ProStream X DVB CSA3 scrambling firmware license; one per service required

HIGH THROUGHPUT

Part Number	Description
FW-PRM-X-2G-GATEWAY	ProStream X 2Gbps throughput firmware license

SPLICING

Part Number	Description
LIC-PRM-X-SPLICING	Software license for ProStream X platform enabling splicing (Ad Insertion) one channel. The license allows 1 video channel splicing for MPG-2/AVC HD/SD Channel. This license is limited by one platform capacity

TERRESTRIAL

Part Number	Description
FW-PRM-X-T2MI-GTW	Generation of one DVB T2-MI stream over ASI or IP
FW-PRM-X-SFN	Generation of one DVB T SFN MIP Insertion TS

NMX™

NETWORK MANAGEMENT SYSTEM



Harmonic's NMX™ Network Management System is the definitive video network management solution, encompassing a powerful set of tools for monitoring and managing Harmonic compressed digital video and audio systems.

NMX allows operators to run their technical infrastructure in a way that parallels their business — as a series of revenue-generating workflows rather than as a set of discrete hardware components. Available for both traditional hardware-based infrastructures and next-generation, virtualized environments, NMX offers a simple and intuitive interface for creating and modifying channel lineups. It can also be used to set system parameters, whether encoding or rate-shaping; in this instance, the underlying equipment is automatically reconfigured to accommodate the new settings. Status for services and hardware, including alarms, is passed through to the top level, ensuring that problems are quickly detected and resolved. Redundancy is automated.

Adding, reconfiguring or removing services or equipment is fast, easy and error-free with NMX. Templating, wizards, consolidated data views and powerful cut-and-paste functions are available for both service and system modifications. A three-pane layout affords the operator an easier overview into their service paths through the network elements.

NMX is designed for 24x7 management of Harmonic Electra® encoders, ProStream® stream processors, the new generation of XOS appliances including packager for OTT applications and other components in the workflow. It can run on a single computer or be distributed across multiple servers for maximum availability. Service and configuration data are stored in a reliable, industrial-strength database. NMX provides multi-level security, ensuring full control of operational privileges. In addition, a comprehensive audit trail and consolidated alarm log pinpoint hardware or operational problems.

In a virtualized video infrastructure featuring the VM versions of Electra X and ProStream X, NMX is used to perform the application-level management and provisioning. NMX provides the video network group creation, service configurations, application alarm/events/fault monitoring and failover in the same way it manages and provisions dedicated video-processing appliances. NMX server itself can be deployed as a VM running under VMware vSphere®.

NMX is highly scalable and extensible, growing in tandem with the environment it supports. The client/server architecture supports both the centralized management of even the most geographically distributed environments, as well as the remote management of a centralized environment, all using standard TCP/IP LAN/WAN technologies. The use of standard-based interfaces enables NMX to interconnect with other subsystems, including umbrella management, conditional access, automation, and scheduling. As the managed environment grows in scope and scale, NMX can distribute its processes across multiple PC platforms, as necessary, providing inexpensive raw processing power.

Moreover, through historical analysis, NMX offers detailed reporting of bandwidth usage and alarm behaviors, allowing operators to identify system-wide trends and improve overall network stability.

HIGHLIGHTS

- Service-oriented to work the way operators work
- “Input to output” GUI and functionality
- Template, spreadsheet, and wizard-based configuration for fast system setup
- Scalable to any size system
- Manage traditional hardware-based and virtualized video infrastructures
- Centralized management of geographically distributed systems
- Distributed processing for high availability
- Flexible redundancy management
- Global Recovery System management through umbrella NMX feature
- Powerful automation interface
- Internal DPI server supports SCTE standard digital program insertion cue message injection
- User administration/security/audit trail tools
- Extensible third-party device monitoring using GPI closures and SNMP
- Historical and statistical analysis of bandwidth and alarm behaviors
- Advanced automation and scheduling engine

FEATURE SUMMARY

- Network, Service Control & Provisioning
- Redundancy Support (1:1, N:1, N:M)
- Basic Alarm Package (Pending alarms, history alarms, status colors on icons)
- PSI/SI Package (PSI/SI table support, private descriptors)
- CAS Package
- Advanced Alarm Package (Advanced alarm configuration, alarm forwarding, consolidated alarm viewer)
- Security Management Package (Full user administration tools, audit trail)
- Automation Server Package (Access the automation server and scheduling engine)
- Distributed Management Package (Monitoring and control of geographically distributed systems)
- NMX PC Fail-Safe Package (NMX 1:1 redundancy, auto-restart)
- Available as a VM
- Maximum number of connected client applications: 25

APPLICATIONS

- Satellite
- Centralized or distributed cable
- Virtualized Video Infrastructure
- VOD
- Multiscreen
- Terrestrial
- Telco
- Network distribution
- Backhaul
- Network PVR

USER-FRIENDLY

- Templates at device and system level
- Cut, copy and paste functions
- Wizard-based setup
- Batch-driven automation tools
- Spreadsheet tool User-friendly

SERVICE MANAGEMENT

- Simple template-based service setup
- Extraction of service information
- Service level or PID level manipulation
- Service tracking across topology
- Dynamic PSI/SI table generation
- Completely flexible private descriptor generation
- Virtual service and stream management
- Service-oriented alarms and analysis
- Program suspend/resume

TOPOLOGY MANAGEMENT

- Graphical view of network and devices
- Geographical background maps
- Multi-level maps
- Component backplane views
- Cut, copy and paste replication
- Template-based topologies
- Online and offline operation

CONFIGURATION MANAGEMENT

- Device, module and port-level configuration
- Consolidated views for easy setup
- Template-based configuration

FAULT MANAGEMENT

- Manual or automatic redundancy switching
- Router-based, path-based or IP-based redundancy mechanisms
- GPI (contact closure) device monitoring tool
- SNMP-based monitoring of third-party hardware
- Alarm configuration
- Monitoring and alarm logging, highlights affected services and hardware
- Standard PERL scripting tool for automatic emails, pages or SMS messaging on fault conditions
- SNMP-based alarm forwarding agent with alarm filtering

SECURITY MANAGEMENT

- Full user administration tools for multi-user environments
- LDAP user authentication support
- Multi-level access privilege
- Access can be geographically limited
- Lockouts to manage secure modifications in multi-user operations
- Comprehensive audit trail

TABLE SUPPORT

- MPEG-2, DVB, ATSC compliant
- PSI/SI generation
- Flexible descriptor generation
- Accepts PSI/SI from external sources

CONDITIONAL ACCESS SUPPORT

- DVB Simulcrypt V3
- OpenCAS
- AES
- Full CAS redundancy support
- Internal EIS

TRAFFIC/AUTOMATION/EIS INTERFACES

- Advanced scheduler with timeline user interface
- Easy external triggering of user-defined service/configuration states
- DVB EIS-Muxconfig support
- DVB SIMPCOMP-MUXNOTIFY support
- Internal EIS
- Extensive coverage and easy to integrate RESTful API
- Internal DPI server supports SCTE standard DPI cue message injection

SOFTWARE MANAGEMENT

- Storage and distribution of software for easy update across distributed networks
- Background download

NMX FAIL-SAFE MANAGEMENT

- Automatic 1:1 NMX server redundancy
- Auto-restart capability
- Powerful catalog and service plan backup/restore management

MONITORING SOLUTIONS

Integrated with multiple monitoring solution vendors for an integrated headend
Control and integration with a wide array of decoders

STATISTICAL ANALYSIS

Statistical analysis of alarm behavior
Inventory and device status reports

STANDARDS-BASED

SNMP
XML
TCP/IP
REST

DEPLOYMENT OPTION: APPLIANCE

Server model	HPE ProLiant DL360 Gen10
Hard Drives	Dual SSDs - RAID 1 – hot swappable
NIC	Four 1GbE ports (RJ45)
Power	Dual redundant power supplies, hot swappable 100/240 VAC, 50/60 Hz input Max power @ Room temp – 265W (904 BTU) Max power @ Max temp – 325W (1109 BTU)
Environmental	Operating temperature: 10°C to 35°C (50°F to 95°F) Non-operating temperature: -30°C to 60°C (-22°F to 140°F) Operating humidity: 8% to 90% EMC Class A: FCC, CE, VCCI, KC, CCC, TCVN, CTick, BSMI Product Safety: US/CA NRTL, CB Scheme, BIS, CCC, EAC, BSMI Product Materials: EU RoHS, China RoHS, EU REACH, WEEE
Physical	1-RU server Dimensions (HxWxD): 4.3 x 43.5 x 70.7 cm (1.7 x 17.1 x 27.8 in) Weight: 15kg (33 Lbs)
Management (IPMI)	Yes. HW alarm monitoring Integrated in NMX SW (thru iLO).
Operating System	Windows Server 2019 / SQL Server 2017

DEPLOYMENT OPTION: VM OR CUSTOM HARDWARE

Recommended System Requirements:

Processor	16 virtual CPUs (Intel® Xeon® processor E5-2620 equivalent)
Memory	32 GB RAM
Disk size	480 GB
NIC	Four 1GbE ports
Operating System (for Custom Hardware)	Windows Server 2019 / SQL Server 2017 (included in NMX ova file)

ORDERING INFORMATION

NMX-HWP-3G-A	NMX 1RU, High performance HPE server, for NMX SW version 8.5 and beyond. Windows Server 2019 and SQL 2017 included.
LIC-NMX-BASE	NMX Software Enterprise version 7 and beyond – License
LIC-NMX-BASE-BCKP	NMX Software Base Backup License (for 1+1 Redundancy).
LIC-NMX-BASE-VM	NMX (VM) Software Enterprise version 8.5 and beyond – License
LIC-NMX-BASE-BCKP-VM	NMX (VM) Software Base Backup License (for 1+1 redundancy), version 8.5 and beyond
SW-NMX-REST-API-E	Software license for Managing and Monitoring devices and services using NMX Restful API
SW-NMX-EIS-E	Software license to enable NMX Internal EIS (Event Information Scheduler) – ProStream CAS
SW-NMX-DCO-E	NMX Client License (Designer, Operator) – one is provided in NMX base SW. One license per additional client to be connected at the same time
SW-NMX-SEO-E	NMX Software Stream Editor License. Stream editor client – one is provided in NMX base SW. One license per additional client to be connected at the same time
LIC-NMX-DEVICE-CONF	Software license for Management of device whose configuration is under NMX control (Electra X/XOS, ProStream X, SDI routers and 2:1 switches, etc). Per device. Monitoring-only devices does not require any license
SW-NMX-DEMO-E	NMX Demo license – Temporary enables all software option - 90 Days

ProSwitch

IP & ASI REDUNDANCY SWITCH



For applications requiring fast, dense and reliable 2:1 MPEG-2 transport stream redundancy switching, the ProSwitch from Harmonic is the best-in-class solution to ensure 24/7 availability of digital TV signals.

When down time is not an option, you can depend on the ProSwitch. The compact, stand-alone system continuously monitors your MPEG-2 TS, seamlessly switching to a backup stream if the active stream is detected as being corrupted. Whether used for equipment redundancy or network-path redundancy, the ProSwitch offers the utmost in performance, flexibility and delay capability to increase robustness and maximize up time of your broadcast and transmission chains – and ensure that your MPEG-2 TS (DVB, DVB-T/T2 or ATSC) can be properly secured.

Offering up to 16 2:1 IP switches or four 2:1 ASI switches in 1 RU, the high-density ProSwitch provides cost, power and space savings, helping operators to save on CAPEX and OPEX.

Reliable & Flexible

Available with Gigabit Ethernet or ASI interfaces, the ProSwitch is suitable for any type of architecture: from widely deployed ASI-based headends to new IP-centric networks. The switch is equipped with dual power supplies/plugs to maximize service availability, and maintains service delivery via a smart and configurable bypass mechanism on the GbE and ASI interfaces – even in case of power failure.

Highly Configurable Testing

The ProSwitch measures the health of incoming streams via a wide range of configurable tests. It supports TR 101 290 tests (Priority 1/2/3) to provide a complete health-status check of your digital DVB network. The unit also supports testing and monitoring models that provide the same level of comprehensive information for ATSC environments. To improve redundancy, template checking of expected PIDs, rate limits and/or scrambling status of various critical program components are available. Each test can be configured and associated to a critical alarm level that either engages switching or logs the alarm. In addition, tests can be set to avoid unwanted switching in the case of transitory events (time persistence mechanism).

Delay Compensation Capability

The ProSwitch offers delay-compensation capability by simultaneously analyzing delayed input streams (from several milliseconds to several seconds). If one input is detected as being corrupted, the unit compensates for the time difference and switches seamlessly to the other uncorrupted stream without any disturbance to end users. The typical application is network distribution redundancy.

Designed For Terrestrial Networks

ProSwitch can perform seamless switching for DVB-T/T2 terrestrial networks, by preserving the SFN structure of the incoming transport streams. In DVB-T, ProSwitch can realign the megaframe structures, generated by the upstream SFN adapters. In a DVB-T2 environment, it also realigns the T2-MI streams generated by the upstream DVB-T2 gateways (such as the Harmonic ProStream™ X processor).

In case of switching, the ProSwitch preserves the structure and timestamp on its output, avoiding service outage on DVB-T/T2 modulators caused by resynchronization.

HIGHLIGHTS

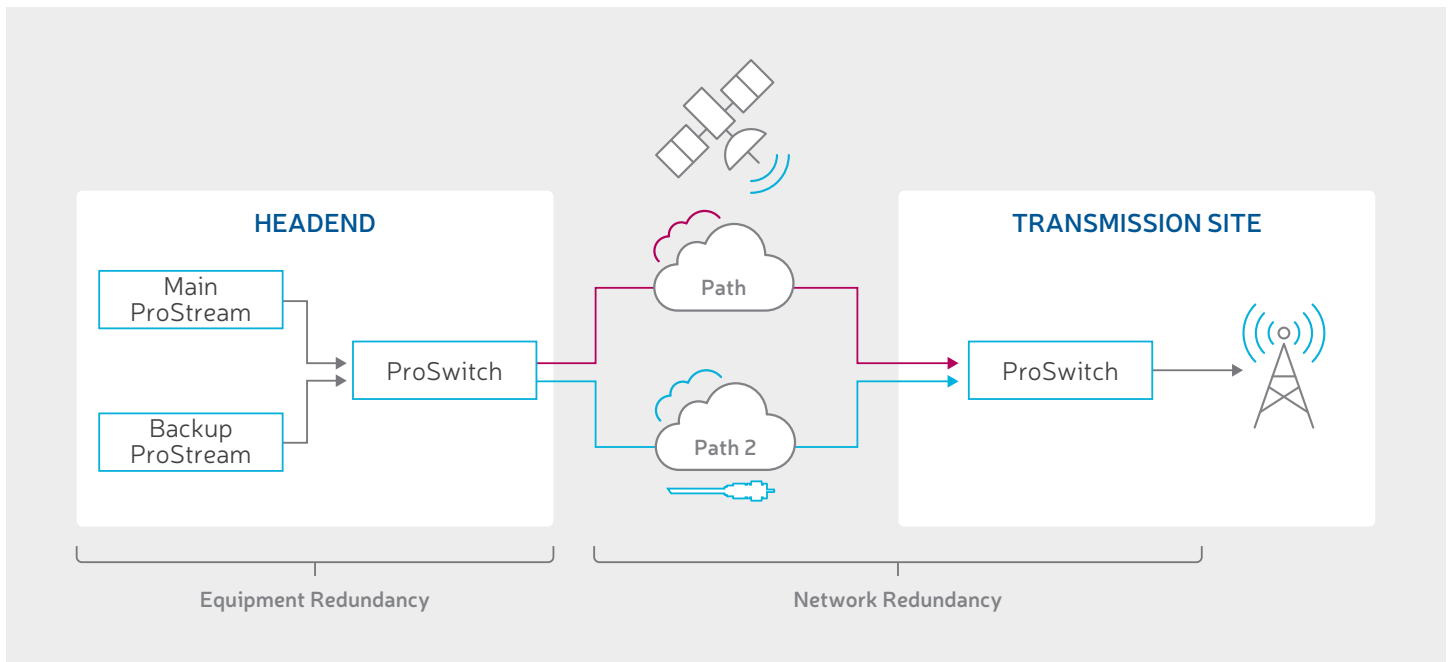
- Dense 2:1 switch in 1 RU
 - Up to 16 TS over IP switches (up to eight with DVB-T/T2)
 - Up to four TS over ASI switches
- Seamless switching
- DVB, DVB-T/T2 and ATSC support
- Input delay compensation
- Smart bypass on ASI and GbE
- TR 101 290 Priority 1/2/3 analyses
- MIP analyses for DVB-T/SFN
- T2-MI/DVB-T2 analyses
- Template checking for stream content matches
- Dual AC PSUs

Configuration & Supervision

The ProSwitch is equipped with a 100/1000Base-T port for control and supervision. The unit can be supervised and configured remotely through any standard web browser, and provides a complete display of switching configurations, along with easy-to-read input/output status information, error-log data and bitrate graphics. The ProSwitch embeds an SNMP agent for centralized management applications.

World-Class Service and Support

Harmonic stands behind the ProSwitch redundancy switch with comprehensive service and support programs, including system design, service deployment, technical support and network maintenance. World-class service plans and a global network of flexible and responsive support professionals help ensure your ability to deliver outstanding “anytime, anywhere, any-device” customer experiences.



ProSwitch Application Example

SPECIFICATIONS

TS OVER ASI SWITCH

- Up to four 2:1 TS over ASI switching functions
- Up to eight ASI inputs
- Up to eight ASI outputs: four smart secured outputs, four smart outputs
- Smart bypass on ASI outputs to preserve user-selected TS inputs or last switch position
- Byte or packet mode automatic detection
- Configurable ASI outputs for monitoring purpose

TS OVER IP SWITCH

- Up to 16 TS over IP switching functions (up to eight in case of DVB-T/T2)
- Four GbE 100/1000Base-T ports (twisted pair, RJ45)
- Configurable bypass on GbE ports (link down mode pass-through mode)
- IPv4
- UDP/RTP or UDP encapsulation
- Multicast
- IGMPv2/v3
- VLAN
- TS over IP output duplication (up to four per switching function)

SPECIFICATIONS

DELAY COMPENSATION

- Available on ASI and IP switches (up to several seconds)
- TS seamless switching for identical TS (network redundancy)
- DVB-T/SFN seamless switching (mega-frame)
- DVB-T2/SFN seamless switching (T2-MI) with ProStream X (T2-MI gateway)

SWITCHING CONDITIONS

- Full real-time monitoring of all incoming transport streams
- TR 101 290 Priority 1/2/3 analysis
- Advanced tests: PID max/min bitrate, stuffing max/min bitrate, service presence, scrambling PIDs, DVB-T MIP checking, DVB-T2 T2-MI packet checking

SWITCHING STRATEGIES

- Automatic switch supporting TS input priority (Main/Spare mode)
- Automatic switch on TS input upon failure (Redundancy mode)
- Manual switch

CONTROL & SUPERVISION

- Web GUI for remote control
- SNMP v2 agent for NMS
- Ten GPI inputs
- Four contact closure outputs

PHYSICAL

- Dimensions (H x W x D) 1.7 in x 17.2 in x 16 in (1 RU)
4.3 cm x 44 cm x 38 cm
- Weight 11.1 lbs/5.6 kg
- Power Supplies Dual and Redundancy
- Input Voltage 100-240 VAC
- Input Frequency 50-60 Hz
- Power Consumption Up to 55 W

ENVIRONMENTAL

- Operating Temperature 41° to 104° F
5° to 40° C
- Storage Temperature -13° to 158° F
-25° to 70° C
- Operating Humidity < 95% non-condensing
- Electromagnetic Compliance EN55032
EN55024
EN61000-3-2
FCC, ICES
- Safety IEC 60950
EN60950
CSA/UL60950
IEC 62368
EN62368
CSA/UL 62368
K60650
AS/NZS 60950
- CE Low Voltage Directive 2014/35/EY
EMC Directive 2014/30/EU
ROHS Directive 2011/65/UE
WEEE 2012/19/EU
REACH 2006/1907/EC

ORDERING INFORMATION

BASE SYSTEM

Part Number	Description
PSW-1U-2AC-ASI	1-RU chassis with redundant AC power supply, eight ASI input + eight ASI output (including four bypass output), 10 GPI input and four free voltage contacts
PSW-1U-2AC-IP	1-RU chassis with redundant AC power supply, four GbE ports (including port bypass), 10 GPI input and four free voltage contacts
PSW-SW-BASE	Software release. Enables product configuration, control and supervision (Web GUI and SNMP)

SOFTWARE OPTIONS

One license required per chassis.

Part Number	Description
PSW-LIC-DVB	Enables DVB streams analysis and seamless switching
PSW-LIC-DTT	Enable terrestrial streams analysis and seamless switching (DVB-T with MIP packets and DVB-T2/T2-MI)
PSW-LIC-ATSC	Enables ATSC streams analysis and seamless switching

SWITCHING LICENSES

One license required per switching function (e.g., three licenses required for triple ASI or TS over IP switch).

Part Number	Description
PSW-LIC-ADV-SWITCH	1:1 switching license, advanced TS input monitoring including TR101290 Priority 1/2/3 and advanced tests