ProStream® 1000 with ACE®

Real-Time Stream Processor and Transcoder

HIGHLIGHTS

- High-quality, high-density transcoding of 60 SD or 20 HD MPEG-2 and MPEG-4 AVC broadcast channels

- 20 SD/HD inputs for multiscreen transcoding with up to 80 output profiles

- SD/HD MPEG-2-to-MPEG-2 and MPEG-4 AVC-to- MPEG-4 AVC re-encoding

- HD-to-SD down conversion

- Multiple output streams per input service to support simulcast, triplecast, SDV and VOD

- Up to 16 integrated statmux pools with DiviTrackMX™

- Audio transcoding and automatic audio leveling adjustment

Consumers are increasingly watching video content in a time-shifted, on-demand, mobile and personalized manner on a growing variety of devices. To enable this "any video to any device" environment, service providers need a cost-effective and scalable solution — one that can mesh with their current infrastructure, seamlessly adapt to codec changes, and repurpose content from different sources and formats, all while maximizing their subscribers' quality of experience.

Enter the best-in-class Harmonic ProStream® 1000 with ACE® real-time SD/HD processing and transcoding system. Featuring award-winning multiplexing, scrambling and transcoding capabilities, ProStream 1000 with ACE is the industry's first truly converged solution for advanced processing and transcoding of SD and HD MPEG-2 and MPEG-4 AVC (H.264) video and audio for broadcast and over-the-top (OTT) mobile/web applications. The highly versatile and ultra-dense processing platform is ideal for functions including:

- Any-to-any and any-to-many video/audio transcoding
- Automatic audio level adjustment
- Statistical multiplexing
- Advanced remultiplexing
- Scrambling and descrambling
- Forward error correction

ProStream 1000 with ACE leaps over competing stream-processing platforms by enabling the cost-effective deployment of next-generation SD and HD broadcast and OTT multiscreen services from a single, highly scalable, 1-RU device. It can simultaneously transcode video content for both broadcast and OTT mobile and web applications while providing unmatched video quality. In addition, the ProStream 1000's power-efficient design helps operators reduce OPEX — and their carbon footprint, as it draws only 10 watts per HD channel and less than 3 watts per SD channel.

BUSINESS BENEFITS

Best CAPEX Investment

ACE transcoding functionality enhances the already extensive stream processing capabilities of the ProStream 1000 platform. The industry's first video processor with DVB-CSA and AES scrambling, remultiplexing and splicing capabilities, ProStream 1000 with ACE can be easily repurposed via firmware upgrades to support new applications driven by the ongoing evolution of video service delivery.

Simulcast for Cable

Operators increasingly need to re-encode the same content for multiple consumer devices across multiple distribution mechanisms, such as linear broadcast, switched digital video (SDV) or IPTV over cable. ProStream 1000 with ACE can simultaneously generate 3:1 HD statmux, SD MPEG-2 for legacy STBs, SD/HD H.264 for IPTV, and a CBR version for time-shifted TV, all from a single HD input.

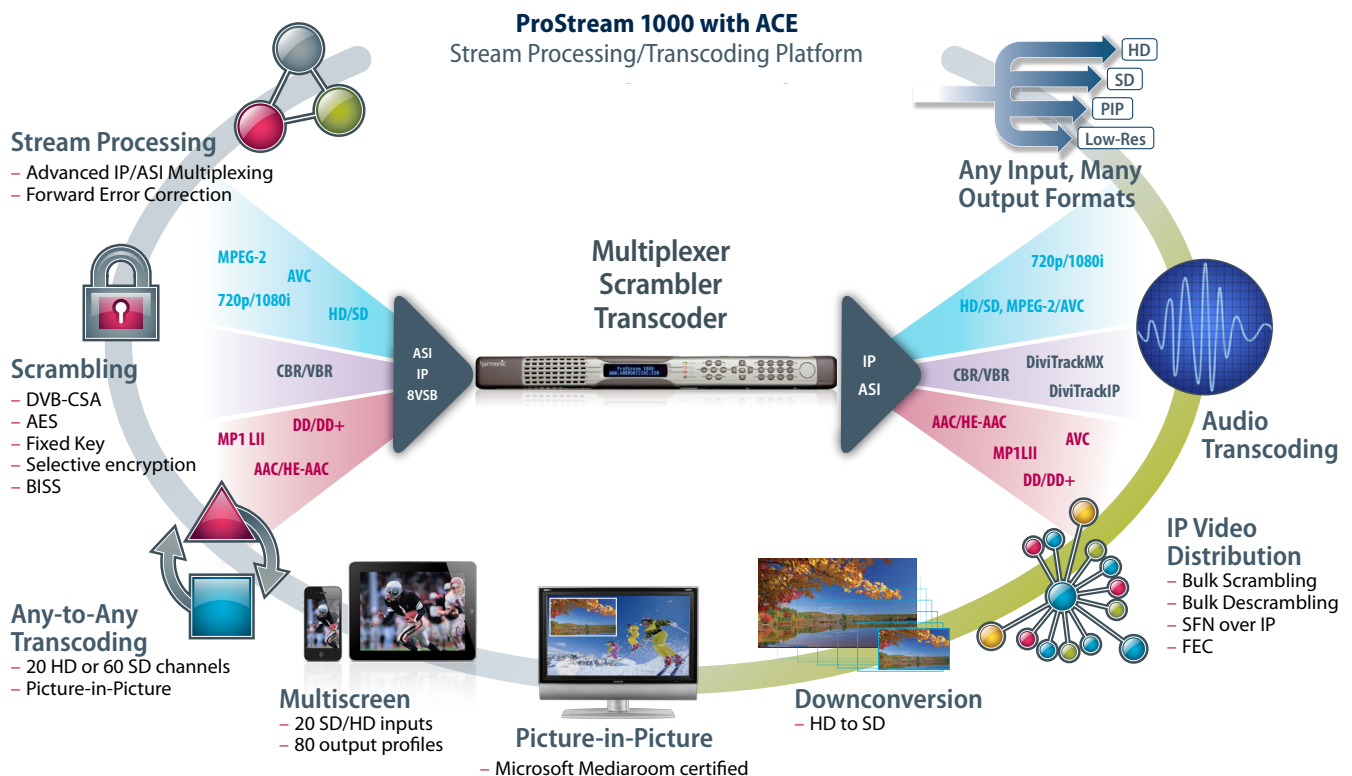### Edge Transcoding and Statmux for Hybrid Operators

Primary and secondary distribution networks are migrating to H.264 to enable significant bandwidth savings. With the transcoding capabilities of ProStream 1000 with ACE, service providers can cost-effectively transcode at the edge of their network to any codec and format, without compromising video quality.

Dense Transcoding for IPTV

ProStream 1000 with ACE can transcode up to 60 SD or 20 HD MPEG-2 channels to superior-quality H.264, making it an ideal choice for IPTV operators.

Optimized Multiscreen Workflows

ProStream 1000 with ACE fits seamlessly into a Harmonic multiscreen workflow, providing an optimized system for preparing content for adaptive bitrate streaming to IPTV and OTT devices. This flexibility helps users maximize the value of their content by providing the ability to simultaneously generate broadcast television services and mobile/web device profiles from a single compressed SD or HD input.

ProStream 1000 with ACE
Stream Processing/Transcoding Platform

Stream Processing
– Advanced IP/ASI Multiplexing
– Forward Error Correction

Scrambling
– DVB-CSA
– AES
– Fixed Key
– Selective encryption
– BISS

Any-to-Any Transcoding
– 20 HD or 60 SD channels
– Picture-in-Picture

Multiscreen
– 20 SD/HD inputs
– 80 output profiles

Picture-in-Picture
– Microsoft Mediaroom certified

Downconversion
– HD to SD

Multiplexer Scrambler Transcoder

MPEG-2 / AVC / 720p/1080i / HD/SD / CBR/VBR / DD/DD+ / MP1 LII / AAC/HE-AAC

ASI IP 8VSB

IP ASI

720p/1080i / HD/SD, MPEG-2/AVC / CBR/VBR / DiviTrackMX / DiviTrackIP / AAC/HE-AAC / AVC / MP1LII / DD/DD+

Any Input, Many Output Formats
HD / SD / PIP / Low-Res

Audio Transcoding

IP Video Distribution
– Bulk Scrambling
– Bulk Descrambling
– SFN over IP
– FEC

TECHNICAL BENEFITS

Any-to-Any Transcoding
ProStream 1000 with ACE accommodates up to four ACE audio/video processing modules per chassis. The platform enables any-to-any transcoding of:

- 60 SD or 20 HD MPEG-2 or H.264 broadcast services per RU
- Up to 20 SD/HD inputs with 80 multiscreen output profiles per RU
- Dolby® E, Dolby Digital (AC-3), Dolby Digital Plus (E-AC-3), AAC, HE-AAC, MPEG-1 Layer II audio codecs

Multi-Function Stream Processing
In addition to unmatched transcoding performance, the ProStream 1000 advanced stream processing core provides multiplexing, scrambling, PSIP and DVB table manipulation, and digital ad insertion over IP and ASI. A complete range of IP and ASI remultiplexing functionality is supported, including PID remapping, PID prioritization and filtering, DVB-EIT and PSIP table regeneration, PCR generation, TS and mirroring.

Advanced Statistical Multiplexing
Statmux options for ProStream 1000 with ACE include the integrated DiviTrackMX™ engine, a "statmux-in-a-box" capability that enables the creation of up to 16 pools of transcoded channels for digital turnaround (DTA) services; and DiviTrackIP™, an IP-based feature for LAN or distributed WAN environments that enables statmuxing of up to 16 pools, 64 channels per pool.

Enhanced Audio Processing
Able to transcode any broadcast audio codec, ProStream 1000 with ACE addresses the most complex audio processing scenarios, such as transcoding from MPEG-1 Layer II to AC-3 or AAC+. For U.S. service providers, integrated Jünger Level Magic™ audio level adjustment enables compliance with the CALM Act by automatically eliminating audio level changes both within a channel (such as during commercial breaks) and when switching from one channel to another.

Reliable Scrambling
Fully compliant with widely implemented industry protocols, ProStream 1000 scrambling technology delivers speed and stability. The platform supports DVB SimulCrypt versions 1, 2 and 3, and allows for the simultaneous connection of up to 30 different conditional access (CA) systems from all leading vendors. It also supports AES encryption technologies for scrambling and descrambling applications.
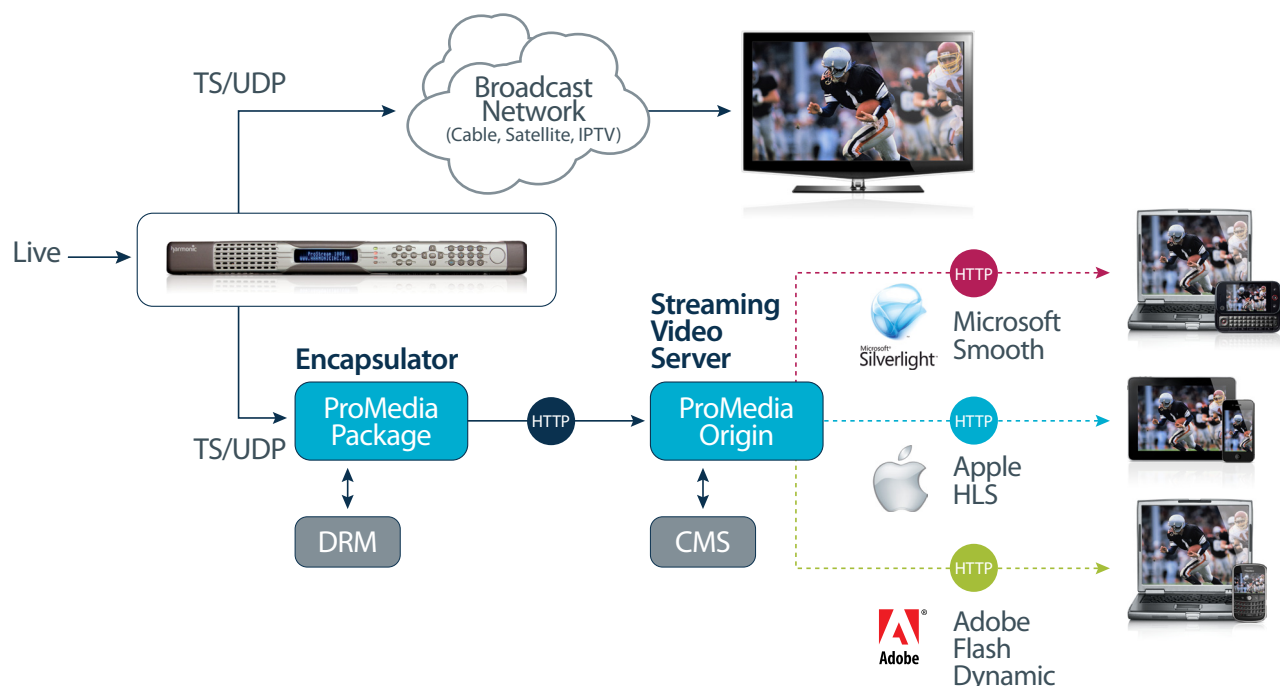
Built-In Broadcast Down Converting
ProStream 1000 with ACE features integrated HD-to-SD down conversion, making the launch of differentiated services, such as an all-HD broadcast of the SD lineup, simple and cost effective.

Control and Management
ProStream 1000 with ACE is easily configured and operates either through a stand-alone web interface or with Harmonic's NMX™ Digital Service Manager for mass configuring, monitoring and automated redundancy in either centralized or distributed architectures.

Broadcast and Multiscreen Workflows
Featuring ProStream 1000 with ACE

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GIGABIT ETHERNET I/O CARD

Type	IEEE 802.3z
IP Ports	Two independent
Connectors	Two 1 GbE SFP (multi mode, single mode, copper)
I/O Speed	1,000 Mbps per port
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	Up to 128 sockets Up to 500 Mbps per card
Maximum Bitrate per Input Socket	160 Mbps
Maximum Bitrate per Output Socket	100 Mbps
Addressing	Unicast and multicast
Management	IGMPv1, IGMPv2, IGMPv3, ARP, ICMP
Forward Error Correction	SMPTE 2021-1 and SMPTE 2021-2

ASI I/O CARD

Type	ASI input/output
Connector	Four BNC, 75 Ω
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 180 Mbps per port
ASI I/O Ports	4-20 (each ASI card has four ports)

8VSB I/O CARD

Type	8VSB input
Connectors	Four F, 75 Ω
MPEG Format	188 B per TS
Input Processing	One MPTS/SPTS per port 19.39 Mbps per port
8VSB Input Ports/ ATSC Tuners	4-16 (four inputs per card, up to four cards)
Tuner Channels	2-59

MANAGEMENT INTERFACES

Ethernet	100Base-TX
Connector	Three RJ45 (one management, one CAS, one unused)

REMULTIPLEXING

Routing	Any input to any output
Redundancy	Device 1:1, N:M, HHP Input service Socket IP port
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, PSIP	Extraction, injection, spooling, regenerating
Output Mirroring	Any to any (ASI/IP to ASI/IP)
Advanced Stream Processing	Intelligent service substitution, PID prioritization, PCR generation, PID range

SCRAMBLING

SCS	Internal
Standards	DVB common scrambling Open CAS DVB SimulCrypt v3 AES-CBC, AES-NSA2 scrambling algorithms Fix key scrambling Selective encryption for trick modes BISS mode 1 AES descrambling
CAS Connections	Simultaneous connections to 30 different CA systems
Number of ECMs	900 ECMs per platform

TRANSCODING/RE-ENCODING, BROADCAST

Re-Encoding/Transcoding	Full decoding and encoding
Scalability	
SD/HD Re-Encoding/ Transcoding	Up to 60 SD services Up to 20 HD services
SD/HD Re-encoding/ Transcoding with Microsoft Picture-in-Picture	Up to 40 SD services + 40 PIP Up to 20 HD services + 20 PIP
HD-to-SD Down Conversion	Up to 20 HD-to-SD services Up to 20 HD-to-SD services + 20 PIP
AFD Handling	Force letterbox Force center-cut Follow AFD (fallback to letterbox) Follow AFD (fallback to center-cut)
Video Re-Encoding and Transcoding (CBR/VBR) 4:2:0	MPEG-2 MP @ ML MPEG-2 MP @ HL MPEG-4 AVC MP @ L3 MPEG-4 AVC HP @ L4
Video Input Filtering	Motion compensated temporal filtering (MCTF)
Aspect Ratios	4:3 and 16:9
SD Resolutions and Frame Rates	
625 lines (PAL), 50 Hz	720 x 576 @ 25 Hz 704 x 576 @ 25 Hz 544 x 576 @ 25 Hz 528 x 576 @ 25 Hz 480 x 576 @ 25 Hz 352 x 576 @ 25 Hz
525 lines (NTSC), 60 Hz	720 x 480 @ 29.97 Hz 704 x 480 @ 29.97 Hz 544 x 480 @ 29.97 Hz 528 x 480 @ 29.97 Hz 480 x 480 @ 29.97 Hz 352 x 480 @ 29.97 Hz
HD Resolutions and Frame Rates	
720p, 50 Hz	1280 x 720 @ 50 Hz 960 x 720 @ 50 Hz
1080i, 50 Hz	1920 x 1080 @ 25 Hz 1440 x 1080 @ 25 Hz 1280 x 1080 @ 25 Hz
720p, 60 Hz	1280 x 720 @ 59.94 Hz 960 x 720 @ 59.94 Hz
1080i, 60 Hz	1920 x 1080 @ 29.97 Hz 1440 x 1080 @ 29.97 Hz 1280 x 1080 @ 29.97 Hz
Conversions (SD/HD)	Horizontal Resolution: Any to any Vertical Resolution: Follow the input Frame Rate; Follow the input Interlaced only
Picture-In-Picture	
Video Bitrate	100-550 Kbps
SD Resolutions	96 x 96 192 x 192 192 x 144
HD Resolutions	128 x 96 192 x 192
Frame Mode	Progressive

Audio	Audio passthrough and synchronization with processed video streams (lip sync)
VBI and Data PIDs	Passthrough Up to four VBI PIDs per output service
Video Input Bitrate	
SD MPEG-2	0.5-12 Mbps
HD MPEG-2	0.5-50 Mbps
SD MPEG-4 AVC	0.5-12 Mbps
HD MPEG-4 AVC	0.5-30 Mbps
VBR Video Output Bitrate (DiviTrackMX)	
SD	0.5-8 Mbps
HD	1-20 Mbps
CBR Video Output Bitrate	
SD MPEG-2	2-8 Mbps
HD MPEG-2	3-18 Mbps
SD MPEG-4 AVC	1-8 Mbps
HD MPEG-4 AVC	3-18 Mbps
Audio Transcoding	
Output Coding Modes	MPEG-1 Layer II AC-3 2.0 & 5.1 E-AC-3 2.0 & 5.1 AAC, HE-AAC (v1 & v2) 2.0 & 5.1
Audio Formats	Stereo (2/0) Joint stereo Dual mono Multichannel (3/2 + LFE, 3/2)
Density	Up to four MPEG-1 Layer II audio streams per video service Up to two AAC/HE-AAC stereo audio streams per video service One AC-3 stereo audio streams per video service One multichannel (5.1) stream per video service
Sampling Frequency	48 kHz
Audio Bitrates	
MPEG-1 Layer II Stereo (2.0)	32-384 Kpbs
AAC Stereo (2.0)	32-384 Kpbs
AAC Multichannel (5.1)	224-640 Kpbs
HE-AAC v1 Stereo (2.0)	32-128 Kpbs
HE-AAC v1 Multichannel (5.1)	96-192 Kpbs
HE-AAC v2 Stereo (2.0)	32-64 Kpbs
AC-3 Stereo (2.0)	96-640 Kpbs
AC-3 Multichannel (5.1)	32-640 Kpbs
E-AC3 Stereo/Multichannel	32-1024 Kpbs
Audio Level Control	Jünger Level Magic

TRANSCODING/RE-ENCODING, MULTISCREEN

Re-Encoding/Transcoding	Full decoding and encoding
Multiscreen Scalability	
HD and SD Inputs	Up to 20 SD/HD services
Output Profiles	Up to 80 output profiles
Output Profile per Input	Four SD
	Two HD
	One HD + three SD
Video Transcoding	MP @ L3
Options (H.264)	HP @ L4
	BP @ L1.2, 1.3, 2.1, 3.0
Bitrate Mode	CBR
	ABR
Bitrate	
Sub SD	0.3-1 Mbps
SD	1-2.5 Mbps
HD	1-5 Mbps

SD Resolutions and Frame Rates

	720 x 576 @ 29.97 & 25
	720 x 404 @ 29.97 & 25
	704 x 576 @ 29.97 & 25
	704 x 396 @ 29.97 & 25
	640 x 480 @ 29.97 & 25
	640 x 360 @ 29.97 & 25
	576 x 324 @ 29.97 & 25
	512 x 288 @ 29.97 & 25
	480 x 360 @ 29.97 & 25
	480 x 320 @ 29.97 & 25
	480 x 270 @ 29.97 & 25
	416 x 240 @ 29.97 & 25
	400 x 300 @ 29.97 & 25
	400 x 224 @ 29.97 & 25
	384 x 216 @ 29.97 & 25
	352 x 288 @ 29.97 & 25
	320 x 240 @ 29.97 & 25
	320 x 180 @ 29.97 & 25
	288 x 162 @ 29.97 & 25
	256 x 144 @ 29.97 & 25
	240 x 180 @ 29.97 & 25
	176 x 144 @ 29.97 & 25

HD Resolutions and Frame Rates

	1280 x 720 @ 29.97 & 25
	1024 x 576 @ 29.97 & 25
	960 x 540 @ 29.97 & 25
	852 x 480 @ 29.97 & 25
	768 x 432 @ 29.97 & 25

SYSTEM MANAGEMENT

NMX™ Digital Service Manager
Stand-Alone Web User Interface

POWER

Input Voltage Range	85-264 VAC
	-48 VDC
Line Frequency	47-63 Hz
Input Power	Single source AB power switch
Power Consumption	160-380 W

ENVIRONMENTAL

Cooling	Inhale: Front
	Exhale: Right
Operating Temperature	32º to 122º F
	0º to 50º C
Storage Temperature	-4º to +158º F
	-20º to +80º C
Operating Humidity	< 95% non-condensing

PHYSICAL

Dimensions (W x H x D)	19 in x 1.75 in x 24 in (1 RU)
	48.26 cm x 4.45 cm x 60.69 cm
Weight	32 lbs/14.5 kg

COMPLIANCE/REGULATORY

Emission	EN55022/CISPR 22 Class A
	EN61000-3-2:1995 = A1:1997 + A2:1998
	EN61000-3-3:1995
	FCC 47 CFR part 15 Class A
Immunity (Radiation)	EN50082-1:1997
	EN55024
UL/ ES (Electrical Safety)	EMC compliant to EU directive 89/336/EEC and 47 DFR part 15, subpart B
	Safety compliant to low-voltage directive 72/23/EEC and 50083-1 standard
	EN 60950 (EC)
	UL 60950 (USA/ Canada)
RoHS	Directive 2002/95/EC