

ProStream® 9100 with ACE®

HIGH-DENSITY STREAM PROCESSOR AND TRANSCODER



HIGHLIGHTS

- Up to four audio/video processing modules per chassis, configurable for broadcast or multiscreen
- High-density transcoding of 60 SD or 20 HD MPEG-2 and MPEG-4 AVC broadcast services
- HD-to-SD down conversion
- Support for Picture-in-Picture and Microsoft Mediaroom applications
- 20 SD/HD inputs with up to 80 multiscreen output profiles
- IP, ASI and 8VSB I/O
- Multiplexing and scrambling of up to 500 services
- Up to 16 integrated statmux pools
- Advanced remultiplexing, scrambling and descrambling
- Linear ad splicing into MPEG-2 and MPEG-4 AVC SD/HD video streams
- Any-to-any audio transcoding
- Integrated Jünger Level Magic™ audio level adjustment



As an ever-increasing quantity of media is consumed through an ever-increasing variety of services—including mobile, connected TV, VOD and OTT—content owners and service providers need an efficient solution for delivering rich video content to multiple devices. They also need to contain costs. The Harmonic ProStream® 9100 with ACE® helps overcome these challenges with the industry's highest-density solution for the processing and transcoding of SD and HD video and audio for broadcast and multiscreen distribution.

The latest evolution of Harmonic's market-leading ProStream platform, the 1-RU ProStream 9100 with ACE delivers superior video quality and the flexibility to support multiple complex digital processing applications, such as digital turnaround, any-to-any audio and video transcoding, linear ad insertion and live adaptive streaming. It addresses current broadcast and multiscreen I/O formats—and scales easily to accommodate future formats.

ProStream 9100 with ACE features an ultrahigh-density architecture that dramatically reduces the amount of rack space required to meet growing processing and transcoding requirements. System flexibility and workflow versatility are achieved with modular audio/video processing modules and next-generation, high-capacity IP processing cards. Low power consumption, high reliability and simplified serviceability result in a best-in-class, multiformat platform that offers superior video quality and OPEX.

High Performance, High Efficiency

High-performance data throughput is a cornerstone function of the ProStream 9100. The platform's optional Quad GbE I/O module delivers up to 2 Gb of IP throughput for the efficient multiplexing and scrambling of up to 500 services.

ProStream 9100 also accommodates up to four ACE audio/video processing modules per chassis. This processing power offers high density and helps users maximize the value of their assets by enabling any-to-any transcoding of:

- 60 SD and/or PIP services, or 20 HD or down-converted MPEG-2 or MPEG-4 AVC (H.264) broadcast services per RU
- Up to 20 SD/HD multiscreen inputs and 80 output profiles per RU
- Dolby® E, Dolby Digital (AC-3), Dolby Digital Plus (E-AC-3), AAC, HE-AAC and MPEG-1 Layer II audio codecs

MARKET BENEFITS

Workflow Optimization for Broadcast and Multiscreen Applications

ProStream 9100 with ACE combines Harmonic's market-leading broadcast SD/HD MPEG-2 and H.264 transcoding capabilities with support for all popular audio formats and emerging multiscreen applications. This ability to deliver content to televisions and mobile devices expands the available audience for both content owners and service providers. ProStream 9100 with ACE simplifies this process by simultaneously generating broadcast services and multiscreen profiles from a single compressed SD or HD input.

Maximized Channel Capacity for Satellite Operators

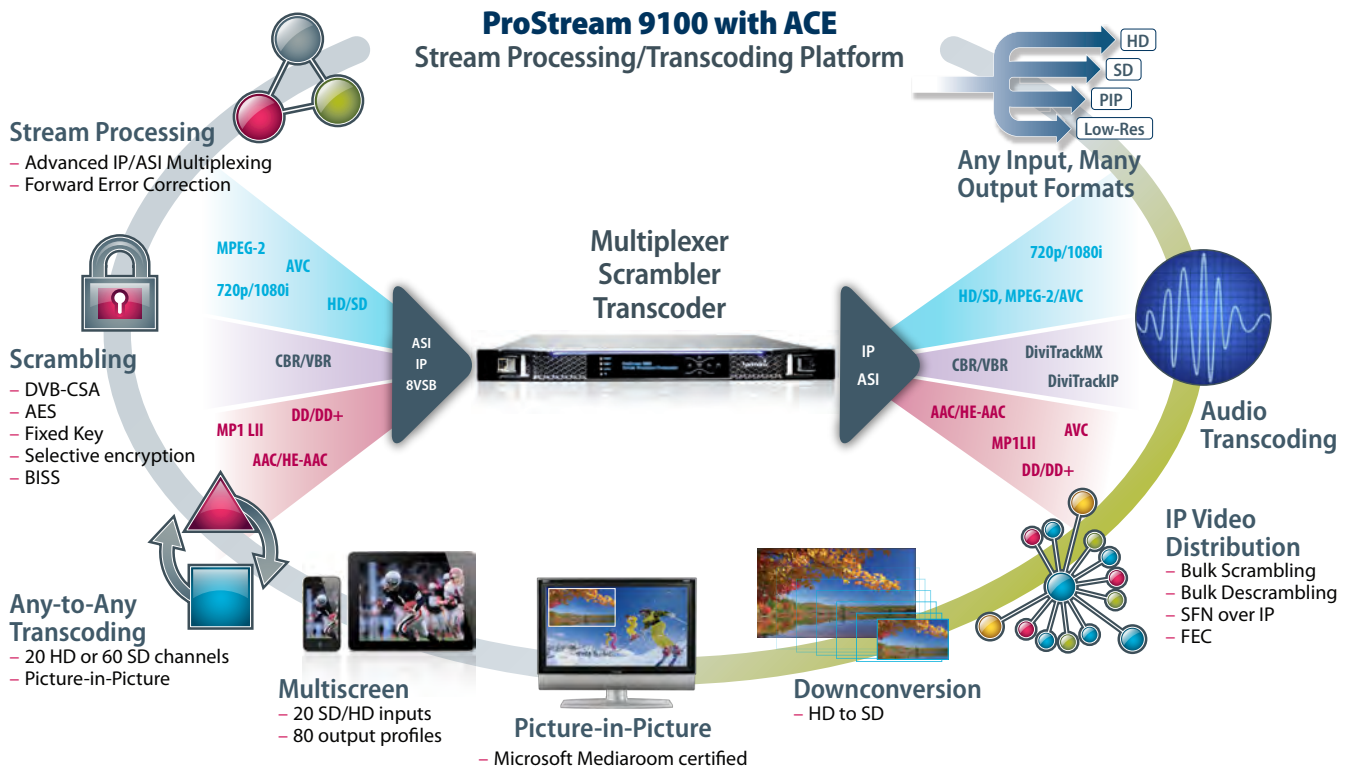
Harmonic statmux technology maximizes bandwidth efficiency to provide satellite operators with more channels per transponder. Statmux options for ProStream 9100 with ACE include the integrated DiviTrackMX™ engine, a "statmux-in-a-box" capability that enables the creation of up to 16 pools of transcoded 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 of remote distributed encoders, 64 services per pool.

Ultimate Flexibility for Cable Operators

ProStream 9100 with ACE offers many advantages for cable operators. The proven ACE transcoding technology supports legacy CBR and VBR applications as well as new IPTV-over-cable services, including multiscreen. Digital turnaround and clamping applications are addressed by a range of features, including any-to-any IP, ASI and 8VSB remultiplexing, scrambling and transcoding, clamping VBR to CBR, and any-to-many transcoding. Simulcast and triplecast applications benefit from the ability of ProStream 9100 with ACE to simultaneously generate MPEG-2 SD for legacy set-top boxes, and SD/HD H.264 and CBR for time-shifted or switched digital video. Integrated DiviTrackMX statistical multiplexing enables 4:1 MPEG-2 HD and 16:1 MPEG-2 SD channels per QAM.

Cost-Efficiency for IPTV Operators

Designed to deliver both high-quality video and high-throughput processing, ProStream 9100 with ACE is a cost-effective solution for delivering hundreds of IPTV channels that support Microsoft® Mediaroom® picture-in-picture and multiscreen applications. The platform supports Forward Error Correction (FEC) and de-FEC in IP networks, enabling bulk scrambling and descrambling for simplified, secure distribution of encrypted content.



Unmatched ROI

The intelligent function integration designed into ProStream 9100 with ACE consolidates video and audio processing and transcoding into a single chassis, allowing users to do more with less. Field-replaceable dual power supplies, fan assemblies, I/O modules and audio/video processing modules offer high

reliability and simplified serviceability, resulting in reduced maintenance costs. Combine these features with the platform's low power consumption of less than 300 watts for a fully populated chassis, and ProStream 9100 with ACE delivers the lowest CAPEX on the market—while also reducing OPEX.

TECHNICAL BENEFITS

Powerful Transcoding

ACE video processing cards enable high-density, any-to-any transcoding of 60 SD or 20 HD MPEG-2 and H.264 broadcast services; up to 20 SD/HD multiscreen inputs, outputting up to 80 profiles; and all audio codecs on a 1 RU platform.

Built-In Broadcast Downconverting

ProStream 9100 with ACE features integrated HD-to-SD downconversion, making the launch of differentiated services, such as an all-HD broadcast of the SD lineup, simple and cost effective.

Optimized Multiscreen Workflows

ProStream 9100 with ACE fits seamlessly into a Harmonic ProMedia™ multiscreen workflow, providing an optimized solution for producing and preparing content for adaptive bitrate streaming. Multiscreen baseline, main and high profile modes are supported.

Enhanced Audio Processing

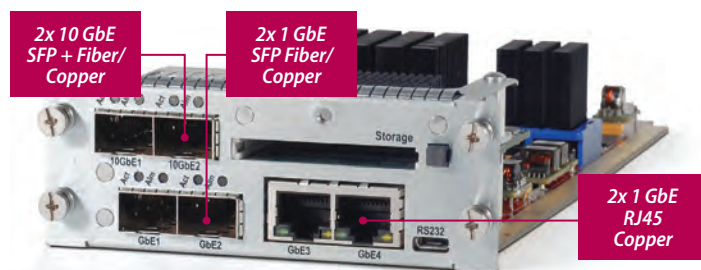
Featuring on-board audio processing and transcoding, ProStream 9100 with ACE can natively transcode up to three stereo pairs or a single multichannel (codec dependent), and perform complex audio processing tasks such as transcoding from MPEG-1 Layer II to AC-3 or AAC+. For U.S. service providers, integrated 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.

Flexible Multiplexing

A complete range of IP, ASI and 8VSB remultiplexing functionality is supported by ProStream 9100, including PID remapping, PID prioritization and filtering, DVB-EIT and PSIP table regeneration, PCR generation, TS and mirroring. Statmux capabilities are available through the integrated DiviTrackMX and IP-based DiviTrackIP options.

High-Throughput IP Processing

The ProStream 9100 offers the choice of either dual or quad Gigabit Ethernet input. The latter option provides an input line rate of 4 Gb and up to 2 Gb of high throughput processing, supporting up to 500 simultaneous multiplexing and scrambling services. Two integrated 10-GbE interfaces reduce the number of router ports required and enable a simplified IP addressing scheme. Separate modules are available for ASI and 8VSB input.



The optional Quad GbE I/O module in ProStream 9100 with ACE delivers up to 2 Gb of IP throughput.

Advanced Scrambling

Fully compliant with widely implemented industry protocols, ProStream 9100 scrambling technology delivers stability and reliability. 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.

Linear Ad Splicing

Linear ad splicing, or digital program insertion, on ProStream 9100 enables the frame-accurate insertion of local and regional ads directly into live-to-air MPEG-2 and MPEG-4 AVC 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.

Ad splicing is a licensed feature for ProStream 9100 systems outfitted with a quad GbE I/O card. The powerful capability enables broadcasters to implement advanced advertising capabilities without needing to purchase a stand-alone, box-level splicing solution, saving them money 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.

Simplified Serviceability

Maintenance on ProStream 9100 with ACE is simplified with a removable front panel and hot-swappable processing cards, power supplies and fan assemblies. These thoughtful serviceability features reduce the chance for down time—increasing the ability to generate revenue.

“Pay As You Grow” Scalability

As processing needs evolve, ProStream 9100 with ACE makes it easy to incrementally add or upgrade transcoding blades, I/O modules and codecs via firmware licensing, simplifying scalability and extending the system’s value.

Control and Management

ProStream 9100 with ACE is easily configured and operated through either a stand-alone web interface or Harmonic’s NMx™ Digital Service Manager video management system, designed for mass configuring, monitoring and automated redundancy in centralized or distributed architectures.

World-Class Service and Support

Harmonic stands behind the ProStream 9100 stream processor—and all of its products—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.



DUAL GBE 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 line rate input per port
IP Encapsulation	MPEG TS over UDP/IP/MAC/RTP/HRTP 1 to 7 TS/IP
MPEG Format	188 B per TS
MPEG Transport Streams	MPTS and SPTS
I/O Processing	250 sockets 500 Mbps per card
Maximum Bitrate per Socket	100 Mbps
Addressing	Multicast, unicast
Management	IGMPv1, IGMPv2, IGMPv3, ARP, ICMP
Forward Error Correction	SMPTE 2021-1 and SMPTE 2021-2

QUAD GBE I/O CARD

Type	IEEE 802.3z
IP Ports	Four independent
Connectors	Two 1-GbE SFP (multi mode, single mode, copper) Two 1-GbE RJ45 Two 10-GbE SFP+
I/O Speed	1,000 Mbps line rate input 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	500 sockets Up to 2 Gb per card
Maximum Bitrate per Socket	160 Mbps
Addressing	Multicast
Management	IGMPv1, IGMPv2, IGMPv3, ARP, ICMP

ASI I/O CARD

Type	ASI input/output
Connectors	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 210 Mbps per input port Up to 187 Mbps per output port
ASI I/O Ports	4-20 (each card has four ports)

8VSB INPUT CARD

Type	8VSB for ATSC reception
Connectors	Four F, 75 Ω
I/O Direction	Input
MPEG Format	188 B per TS
I/O Processing	One MPTS per port Up to 19.39 Mbps per port
8VSB Input Ports	Four per card (up to four cards)
Tuner Channels	2-59
Packet Error Rate Threshold	0-12,892 packets per second
Signal Quality Threshold	0.0-27.0 dB

MANAGEMENT INTERFACES

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

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, PSIP	Extraction, injection, spooling, regeneration
Output Mirroring	Any to any (ASI/IP to ASI/IP)
Advanced Stream Processing	Intelligent service substitution, PID prioritization, PCR generation, PID range

REDUNDANCY

Device	1:1 N:1 N:M Under NMX or stand-alone GUI management
Internal	Service Any-to-any input TS I/O port IP port mirroring TS output mirroring
Triggers	ETR290

SCRAMBLING

SCS	Internal
Standards	DVB common scrambling Open CAS DVB simulcrypt v3 Stream Server Divicom 1.4 AES-CBC, AES-NSA2 scrambling algorithms AES descrambling Fix Key scrambling and descrambling Selective encryption for VOD
CAS Connections	Simultaneous connections to 30 different CA systems
Number of ECMs	900 ECMs per platform

RE-ENCODING/TRANSCODING, BROADCAST

Re-Encoding/Transcoding	Full decoding and encoding
Broadcast Scalability	SD/HD Re-encoding/Transcoding: Up to 60 SD/20 HD services SD/HD Re-encoding/Transcoding + Microsoft Picture-in-Picture: Up to 40 SD services + 40 40 MSFP PIP Up to 20 HD services + 20 40 MSFP PIP HD to SD Downconversion: Up to 20 HD to SD services Up to 20 HD services + 20 40 MSFP 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: 720x576 @ 25 Hz 704x576 @ 25 Hz 544x576 @ 25 Hz 528x576 @ 25 Hz 480x576 @ 25 Hz 352x576 @ 25 Hz 525 lines (NTSC), 60 Hz: 720x480 @ 29.97 Hz 704x480 @ 29.97 Hz 544x480 @ 29.97 Hz 528x480 @ 29.97 Hz 480x480 @ 29.97 Hz 352x480 @ 29.97 Hz
HD Resolutions and Frame Rates	50 Hz: 720p: 1280x720 @ 50 Hz 960x720 @ 50 Hz 1080i: 1920x1080 @ 25 Hz 1440x1080 @ 25 Hz 1280x1080 @ 25 Hz 60 Hz: 720p: 1280x720 @ 59.94 Hz 960x720 @ 59.94 Hz 1080i: 1920x1080 @ 29.97 Hz 1440x1080 @ 29.97 Hz 1280x1080 @ 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 Resolution and Bitrate	Video Bitrate: 100-550 Kbps SD: 96x96, 192x192, 92x144 HD: 128x96, 192x192 Frame Mode: Progressive
Audio Passthrough	Audio passthrough and synchronization with processed video streams (lip sync)
VBI and Data PIDs	Passthrough
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
Video Output Bitrate (CBR)	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 and 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 Kbps AAC stereo (2.0): 32-384 Kbps AAC multichannel (5.1): 224-640 Kbps HE-AAC v1 stereo (2.0): 32-128 Kbps HE-AAC v1 multichannel (5.1): 96-192 Kbps HE-AAC v2 stereo (2.0): 32-64 Kbps AC-3 stereo (2.0): 96-640 Kbps AC-3 multichannel (5.1): 32-640 Kbps E-AC-3 stereo/multichannel: 32-1024 Kbps
Audio Level Control	Jünger Level Magic

RE-ENCODING/TRANSCODING, 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 Profile per Input: 4 SD, 2 HD, 1 HD + 3 SD
Video Transcoding Options	MPEG-4 AVC MP @ L3 MPEG -4 AVC HP @ L4 MPEG-4 AVC 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	720x576 @ 29.97 and 25 720x404 @ 29.97 and 25 704x576 @ 29.97 and 25 704x396 @ 29.97 and 25 640x480 @ 29.97 and 25 640x360 @ 29.97 and 25 576x324 @ 29.97 and 25 512x288 @ 29.97 and 25 480x360 @ 29.97 and 25 480x320 @ 29.97 and 25 480x270 @ 29.97 and 25 416x240 @ 29.97 and 25 400x300 @ 29.97 and 25 400x224 @ 29.97 and 25 384x216 @ 29.97 and 25 352x288 @ 29.97 and 25 320x240 @ 29.97 and 25 320x180 @ 29.97 and 25 288x162 @ 29.97 and 25 256x144 @ 29.97 and 25 240x180 @ 29.97 and 25 176x144 @ 29.97 and 25
HD Resolutions and Frame Rates	1280x720 @ 29.97 and 25 1024x576 @ 29.97 and 25 960x540 @ 29.97 and 25 852x480 @ 29.97 and 25 768x432 @ 29.97 and 25



SYSTEM MANAGEMENT

NMX™ Digital Service Manager
Stand-Alone Web User Interface

POWER

Power Supply	Optional dual supplies
Input Voltage Range	85-264 VAC 42-60 VDC
Line Frequency	47-63 Hz
Power Consumption	Up to 300 W

ENVIRONMENTAL

Cooling	Eight fans, temperature controlled air flow front to right side
Operating Temperature	+32° to +122° F 0° to +50° C
Storage Temperature	-4° to +176° F -20° to +80° C
Operating Humidity	< 95% non-condensing
Electromagnetic Compliance	FCC Part 15 Class A CE Mark (EN 55022 Class A and EN 50082-1:1997)
Safety	UL 1950 and cUL C22.2#950 EN 60950 Directive 2011/65/EU RoHS2

PHYSICAL

Dimensions (W x H x D)	19 in x 1.75 in x 27 in (1 RU) 48.26 cm x 4.45 cm x 68.69 cm
Weight	32 lbs/14.5 kg