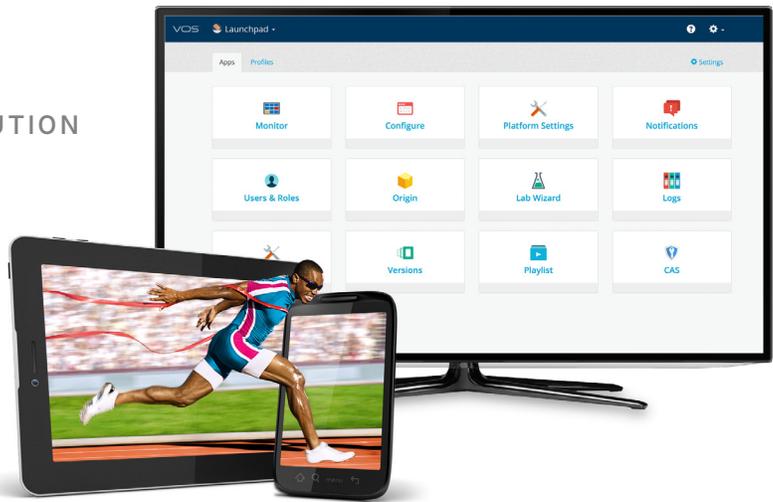# VOS™ CLOUD

CLOUD-NATIVE MEDIA PROCESSING SOLUTION

VOS™ Cloud from Harmonic is a comprehensive software application that transforms traditional video preparation and delivery architectures into a fully orchestrated set of cloud-native functions, accelerating time to market for new broadcast and OTT services.

Unifying the entire media processing chain, from ingest through delivery, VOS Cloud allows content creators and pay-TV operators to launch new video channels fast, and to run simpler, leaner operations. The VOS Cloud application can be installed on any hardware platform in a headend or data center, or as part of a private or public cloud deployment environment.

VOS Cloud features six primary microservices that conform to the essential functions in media processing: Ingest, Playout, Graphics, Transcoding, Encryption and Delivery. Highly efficient workflows are built by simply selecting capabilities within each of these functionalities. Template-based workflows allow for rapid, consistent configuration of system resources.

Built for the Cloud

As a cloud-native application, VOS Cloud features the hallmarks of openness, scalability and agility. Support for OpenStack™ and Amazon Web Services™ (AWS) deployment environments enable system access from anywhere in the world with an internet connection and let you work the way you want, whether on premise or through private or public clouds. Harmonic RESTful APIs provide hooks into your existing operations, simplifying the ability to add VOS Cloud services to your workflow — or remove them — in a matter of minutes.

Multi-cloud support offers your organization unparalleled flexibility. Users can quickly and easily clone new systems, burst to new clouds for incremental capacity gains, and load share between clouds. These capabilities simplify your ability to test and integrate new systems, build out a system on a private cloud and launch it on a public cloud, and cover special events such as concerts and live sports.

Harmonic PURE Compression Engine

Encoding and transcoding on VOS Cloud is performed by the Harmonic PURE Compression Engine™, an advanced, software-based transcoding technology that supports SD, HD and UHD formats and MPEG-2, MPEG-4 AVC and HEVC codecs for broadcast and OTT multiscreen delivery. The PURE Compression Engine utilizes Harmonic's market-leading expertise in video compression algorithms and multi-pass encoding to provide superior video quality at the lowest possible bitrates.

Users can also employ EyeQ™ real-time video optimization, Harmonic's optional enhancement for PURE Compression. Leveraging the function of the human visual system, EyeQ delivers bandwidth savings of up to 50% while ensuring that your viewers can watch pristine video on their device of choice — even over constrained OTT/ABR networks.

HIGHLIGHTS

- Comprehensive software solution for broadcast and OTT media preparation and delivery
- Harmonic PURE Compression Engine and EyeQ technologies for superior video quality at low bitrates
- Deployable in private and public clouds, with any OS on any hardware

- Build or remove services independently in minutes
- Persona-defined user experience
- Template-based workflows for rapid and consistent configuration
- Automatically load-balance and deploy services across available compute resources

- Integration with leading data analytics software systems
- Subscription and usage-based pricing
- Future-proof solution
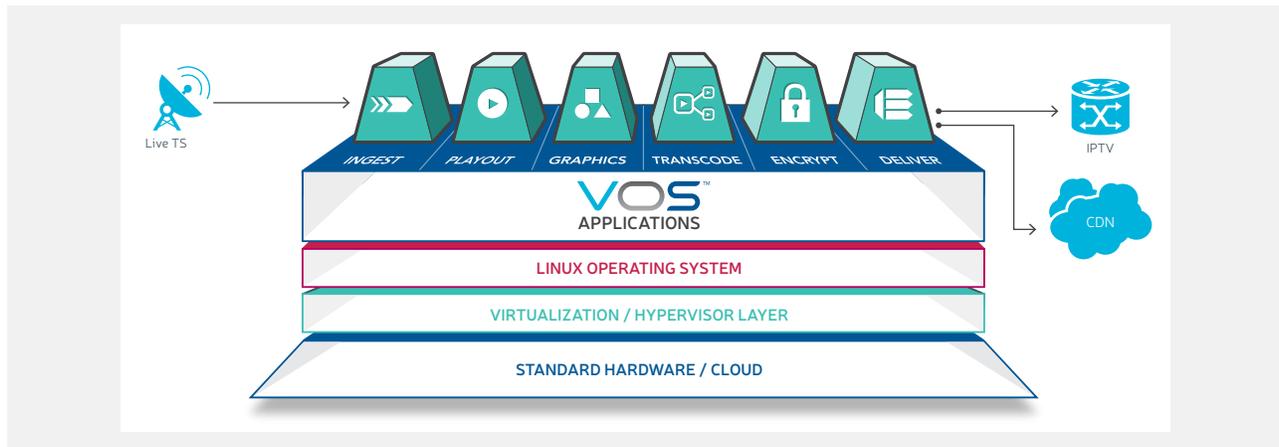
VOS Cloud enables a comprehensive cloud-native ecosystem for channel origination, pay-TV service delivery and OTT multiscreen content preparation.

Business Benefits

Accelerated Time-to-Market
With VOS Cloud's full complement of embedded workflow features, adding a new video channel to your lineup is straightforward and requires just a few steps from the operator. There's no need to choose the target: VOS Cloud will automatically deploy and load-balance compute resources based on a node's resource availability.

Optimizing Costs
VOS Cloud is the perfect fit for customers looking to save on CAPEX and OPEX. The solution's usage-based pricing assures that customers pay only for the functions actually used. Infrastructure usage is optimized via VOS Cloud's ability to automatically release compute nodes when they are not in use. In addition, reliance on the Harmonic PURE Compression Engine and EyeQ technologies enable the distribution of content at dramatically reduced bitrates, helping users save on storage and CDN costs.

Content Monetization
Selling ad space is an essential step toward achieving ROI on an OTT video streaming infrastructure. Integrating with market-leading advertising ecosystem partners, VOS Cloud provides a complete framework for dynamic ad insertion at all levels, covering everything from national ad zones to regional ads to personalized ads. This powerful capability is available for all OTT applications, including live streaming and time-shifting.

Customer Insight
Collection and analysis of customer viewing habits is a critical element for all media organizations. VOS Cloud's integration with leading data analytics software allows you to gain deep insight into customer engagement with your offerings, information that can be used to tailor your services and better monetize content.

Future-Proof
Harmonic's agile development approach assures that individual VOS Cloud services can be upgraded independently and that new capabilities can be added with each new software release. Custom development to optimize integration with third-party software is also available. And because VOS Cloud runs on off-the-shelf Intel® servers, users benefit from the ongoing performance gains of general-purpose CPUs.

VOS Cloud Capabilities

Live Streaming
Securely contribute live 24/7 services and events to your workflow using the Harmonic Cloud Link application. Prepare and deliver MPEG-DASH, Apple® HLS and Microsoft® Smooth Streaming directly to consumer devices via the VOS Cloud infrastructure.

Global Distribution
VOS Cloud delivers content directly to consumers via global CDNs. The application provides management of local and global distribution policies, whitelisting and blacklisting.

Time-Shift TV & Cloud DVR
By interfacing VOS Cloud to a content management system, the CMS can define a recording window for each channel, whether a couple of hours or several months. This capability enables start-over, catch-up and long-lasting catch-up for TV shows that are currently playing, giving consumers complete control over their viewing experience.

Video on Demand
Simply and securely contribute an existing VOD library, and use VOS Cloud to prepare and deliver the catalog directly to subscribers.

Operational Excellence

Simplicity

All VOS Cloud capabilities are orchestrated from a single, intuitive user interface. A persona-defined user experience enables customized interactions with the software based on the user's role within the organization; a night operations manager, for instance, can have access to a different set of system controls than a chief engineer. Configuration, deployment and management of the system are made easy through VOS Cloud's automated video formation technology.

Reliability

VOS Cloud embeds a native load balancer in the application to optimize cloud resources. By leveraging cloud architecture features such as high-availability zones, and by employing redundancy mechanisms on input services and processing nodes, VOS Cloud offers a highly robust ecosystem designed to avoid down time.

Scalability

VOS Cloud is designed to grow with a user's needs. When additional resources are required, the system will automatically ask for them; when fewer resources could be used, they are automatically released. These capabilities enable seamless scaling and reduce the need for an operator to continuously monitor the workflow.

World-Class Service and Support

Harmonic stands behind VOS Cloud with comprehensive support programs, including system design and service deployment. Harmonic also establishes an innovative relationship with VOS Cloud users via a VOS community and DevOps team. The VOS community brings tutorials, videos and articles to users, while the round-the-clock DevOps team includes a global network of professionals dedicated to ensuring your ability to deliver outstanding "anytime, anywhere, any-device" customer experiences.

SPECIFICATIONS

INPUT/OUTPUT

Live Inputs	MPEG-TS via IP MPEG-TS over UDP & IP MPEG-TS over RTP, UDP & IP
File Input	MPEG-TS
Live Outputs	MPEG-TS over UDP & IP MPEG-TS over RTP & UDP & IP 1 to 7 TS/IP
Wrappers	TS, MXF, mp4
Adaptive Bitrate Output	Apple HLS Microsoft Smooth Streaming MPEG-DASH Encoder Boundary Point (EPB) compliant Multi-bitrate transport stream (MBTS) Advanced transport stream (ATS) Integrates with major CDN providers HTTP/HTTPS (WebDAV, POST)

VIDEO PROCESSING

Broadcast Video Decoding	MPEG-2 MP @ ML MPEG-2 MP @ HL MPEG-4 AVC Main & High profiles @ L5 DVCPRO, AVC-Intra 50 & HDCAM50 (offline)
Broadcast Video Encoding	MPEG-2 MP @ ML MPEG-2 MP @ HL MPEG-4 AVC Main & High profiles @ L5 HEVC Main & Main 10
Multiscreen Video Encoding	MPEG-4 AVC Main & High profiles @ L5 HEVC Main & Main 10 Constant Bitrate (CBR) Harmonic EyeQ
Broadcast Resolutions & Frame Rates	720/704/640/544/528/480 @ 23.976/29.97 Hz 720/704/640/544/528/480 @ 24/25 Hz 1280x720 @ 59.94 Hz 960x720 @ 59.94 Hz 1280x720 @ 50 Hz 960x720 @ 50 Hz 1920x1080 @ 23.976/29.97 Hz 1440x1080 @ 23.976/29.97 Hz 1280x1080 @ 23.976/29.97 Hz 1920x1080 @ 24/25 Hz 1440x1080 @ 24/25 Hz 1280x1080 @ 24/25 Hz 1920x1080 @ 59.94 Hz (HEVC/AVC only) 1920x1080 @ 50 Hz (HEVC/AVC only)
Multiscreen Resolutions & Frame Rates	Horizontal: 96 to 1920 pixels Vertical: 96 to 1080 pixels Frame rate: follow the input, half and quarter frame rate
Video Processing Features	Up/down-conversion Smart de-interlacing Scene-cut and fade/dissolve detection Dynamic GOP management with adaptive I-frame insertion Hierarchical LookAhead™ Motion-compensated temporal filtering (MCTF) Aspect ratio handling Blackout management Logo insertion

SPECIFICATIONS

AUDIO PROCESSING

Audio Decoding	MPEG-1 Layer II AAC-LC, HE-AAC v1 and v2 Dolby® Digital (AC-3) Dolby Digital Plus (E-AC-3) Dolby E PCM (offline)
Audio Encoding	MPEG-1 Layer II AAC-LC, HE-AAC v1 and v2 AC-3, E-AC-3
Audio Processing Features	Resampling Static gain Automatic loudness control Stereo/mono conversion Down/up mixing Nielsen Watermark extraction and injection into HLS ID3 tag

SUBTITLING

Broadcast	DVB Teletext, DVB Subtitles, SCTE 27 CEA-608/708
Multiscreen	WebVTT DFXP SMPTE TT CEA-608/708

DATA PASSTHROUGH

SCTE 35	Maintaining frame accuracy splicing
Subtitles	Maintaining audio/video synchronization

CONTENT PROTECTION

Apple HLS	AES-128 CBC FairPlay Sample AES PlayReady
Microsoft Smooth Streaming	AES-128 CTR PlayReady
MPEG-DASH	Common Encryption (CENC) Google Widevine
DVB SimulCrypt	DVB CSA1/2/3 AES-CBC, NSA2 128-bit
KMS	

ABR (OTT) FEATURES

Origin	Blackout management (SCTE 35-based) Apple HLS v3/v4/v5 MPEG-DASH (including HbbTV 1.5) Microsoft Smooth Streaming Catch-up Start-over nPVR Packaging on the fly
Delivery Methods	Pull mode Push mode (POST & WebDAV) for interfacing with CDN Active-active Active-standby
Dynamic Ad Insertion	ESAM compliant

DEPLOYMENT ENVIRONMENTS

Private Cloud	OpenStack versions (Kilo, Liberty, Mitaka) OpenStack platforms (Red Hat, Mirantis, HP Helion, etc.)
Public Cloud	AWS
Templates	Heat AWS CloudFormation
Hypervisors	KVM, Xen
Operating System	Linux
Control & Monitoring	Web Graphical User Interface RESTful API