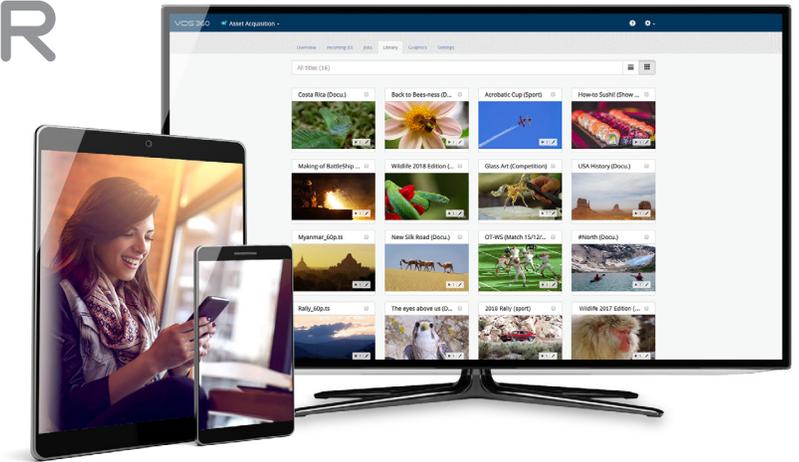# VOS® CLUSTER

MEDIA PROCESSING SOFTWARE

VOS® Cluster from Harmonic is a comprehensive media processing software that transforms traditional video preparation and delivery architectures on any deployment environment, accelerating time to market for new video services and optimizing investment strategies.

Unifying the entire media processing chain, from ingest through delivery, VOS Cluster allows content creators and pay-TV operators to launch new video channels fast, and to run simpler, leaner operations. As a totally infrastructure-independent media processing application, VOS Cluster makes it easy for operators to migrate back and forth between bare metal datacenter computing, public clouds and private clouds. Having an elastic and always up-to-date media workflow enables operators to launch services faster, scale up seamlessly with operational efficiency, and ensure consistent functionality across all deployment environments, which includes delivering exceptional video quality at low bitrates. With a simple intent-driven user interface, and the capability to mix optimized and dynamic cost allocations, operators have more time to test new service offerings and focus on the creative side of their business.

State-of-the-Art Media Processing

VOS Cluster capitalizes on Harmonic's expertise in media processing, embedding market-leading state-of-the-art micro services such as ingest, compression, encryption, packaging and origin server in a unified software solution. Streamlined and consolidated workflows are built by simply selecting required capabilities and leveraging template-based workflows, allowing for rapid, consistent configuration of system resources. Natively built on a REST API, VOS Cluster offers seamless integration into existing operations, simplifying operators' ability to add services to their workflow — or remove them — in a matter of minutes.

VOS Cluster offers organizations unparalleled flexibility. Users can quickly and easily clone new systems, burst to new clouds for incremental capacity gains, and load share between environments. These capabilities simplify the ability to test and integrate new systems, build out a system on a cloud and launch it on another, and cover special events such as concerts and live sports.

Harmonic PURE Compression Engine™

Encoding and transcoding on VOS Cluster are 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.

EyeQ™ content-aware encoding is Harmonic's optional enhancement for the PURE Compression Engine. Leveraging the function of the human visual system, EyeQ delivers bandwidth savings of up to 50 percent while ensuring that viewers can watch pristine video on their device of choice — even over constrained OTT/ABR networks. Harmonic also offers statistical multiplexing for broadcast service optimization by saving up to 25 percent of bandwidth while preserving video quality.

HIGHLIGHTS

- Comprehensive software solution for media processing and delivery
- Harmonic PURE Compression Engine with statistical multiplexing and EyeQ technologies for superior video quality at low bitrates
- Deployable in private clouds and private datacenters

- Build or remove services independently in minutes
- Persona-defined user experience
- Automatically load-balance and deploy services across available compute resources
- Future-proof solution

- Integration with leading data analytics software systems
- Term, subscription and usage-based pricing
- Template-based workflows for rapid and consistent configuration

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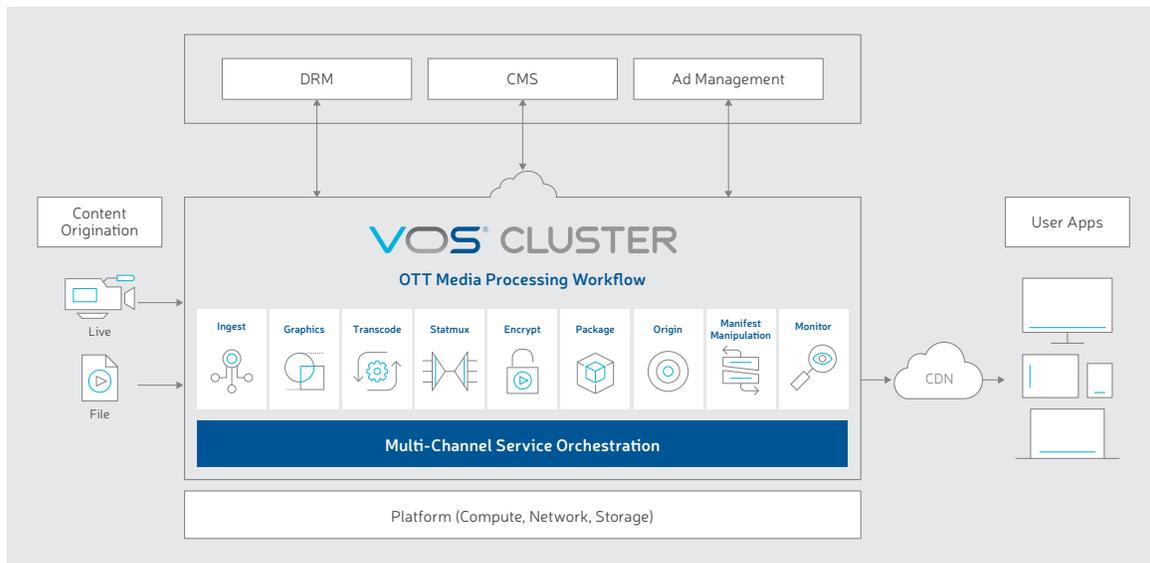
Business Benefits

Accelerated time-to-market

With VOS Cluster, adding a new video channel to the lineup is straightforward and requires just a few steps from the operator. There's no need to choose the target: VOS Cluster will automatically deploy and allocate compute resources based on a node's resource availability.

New ways to optimize costs with a flexible business model

VOS Cluster is the perfect fit for customers looking for a flexible business model. The solution's term or usage-based pricing assures that customers pay only for the functions actually used. 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.

Focus on 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 Cluster provides a complete framework for dynamic ad insertion at all levels, covering everything from national ad zones to regional ads and personalized ads. This powerful capability is available for all OTT applications, including live streaming and time-shifting.

Simple UI for a consolidated workflow

VOS Cluster offers a single and simple user interface that can be used to manage all VOS capabilities. VOS UI allows operators to easily use all the VOS features with just a few clicks.

Future-proof

Harmonic's agile development approach assures that individual VOS Cluster 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 Cluster runs on off-the-shelf Intel® servers, users benefit from the ongoing performance gains of general-purpose CPUs.

VOS Cluster Capabilities

Live streaming

Operators can securely contribute live 24/7 services and events to their workflow using the Harmonic Cloud Link application. Prepare and deliver IPTV, MPEG-DASH, Apple® HLS and Microsoft® Smooth Streaming directly to consumer devices via the VOS Cluster.

UHD OTT

VOS Cluster has been designed to manage large OTT profile encoding jobs leveraging multi-machine synchronization technology. This capability allows VOS Cluster to deploy UHD on any kind of environment for an OTT or IPTV application.

Always up to date with OTT formats

In addition to the well-known standard MPEG-DASH, Apple® HLS and Microsoft® Smooth Streaming for streaming with adaptive bitrate and RTMP protocol (for publishing to social networks),

VOS Cluster already supports the new standard Common Media Application Format (CMAF).

Time-shift TV and cloud DVR

By interfacing VOS Cluster 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.

Streaming video on demand

Simply and securely contribute an existing VOD library, and use VOS Cluster to prepare and deliver the catalog directly to OTT subscribers.

Operational Excellence

Simplicity

All VOS Cluster 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. For instance, a night operations manager 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 Cluster's automated video formation technology.

Reliability

VOS Cluster embeds native resource allocation in the application to optimize resources and employs redundancy mechanisms on input services and processing nodes, offering
a highly robust ecosystem designed to avoid downtime.
Geo-redundancy is supported for OTT encoding and pull packaging workflow.

Scalability

VOS Cluster 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 Cluster with comprehensive support programs, including system design and service deployment.

Harmonic has also established a unique relationship with users via DevOps enhanced support options. The around-the-clock Harmonic Support team includes a global network of professionals dedicated to ensuring operators' ability to deliver outstanding "anytime, anywhere, any-device" customer experiences. VOS Cluster enables the next generation of user experience through on-line modern communication channels and a centralized Hub account for support, download, backups and analytics.

SPECIFICATIONS

INPUT/OUTPUT

Live Inputs	MPEG-TS via IP MPEG-TS over UDP & IP MPEG-TS over RTP, UDP & IP 2022-6 uncompressed input
File Inputs	MPEG-TS, MXF file to file (OP-1A)
Live Outputs	MPEG-TS over UDP & IP, 1 to 7 TS/IP MPEG-TS over RTP & UDP & IP RTMP single profile (push to social media platforms)
Adaptive Bitrate Inputs	Multi-bitrate transport streams (MBTS) Advanced transport streams (ATS)
Adaptive Bitrate Output	Apple HLS Microsoft Smooth Streaming MPEG-DASH CMAF (Common Media Application Format) Encoder Boundary Point (EBP) compliant Integrates with major CDN providers HTTP/HTTPS (WebDAV, POST) RTMP multi-profile

VIDEO PROCESSING

Video Decoding	MPEG-2 MP @ ML MPEG-2 MP @ HL MPEG-4 AVC Main & High profiles @ L5 HEVC Main & Main 10
Video Encoding	MPEG-4 AVC Main & High profiles up to @ L5 HEVC Main & Main 10
Bitrate Mode	Constant Bit Rate (CBR) Harmonic EyeQ (OTT) VBR Stat-Mux (Broadcast)
Standard Resolutions & Frame Rates	720/704/640/544/528/480 @ 23.976/29.97 Hz 720/704/640/544/528/480 @ 24/25 Hz 1280/960 x 720 @ 59.94 Hz 1280/960 x 720 @ 50 Hz 1920/1440/1280x1080 @ 23.976/29.97 Hz 1920/1440/1280x1080 @24/25 Hz 1920x1080 @ 50 Hz (HEVC/AVC only) 1920x1080 @ 59.94 Hz (HEVC/AVC only) 3840x2160 @ 50 Hz (HEVC Only) 3840x2160 @ 60 Hz (HEVC Only)
Multiscreen Resolutions & Frame Rates	Horizontal: 96 to 3840 pixels Vertical: 96 to 2160 pixels Frame rate: follow the input (up to 60), half and quarter frame rate
Video Processing Features	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 (2022-6) PCM (2022-6)
Audio Encoding and Passthrough	AAC-LC, HE-AAC v1 and v2 AC-3, E-AC-3, AC-4
Audio Processing Features	Resampling Static gain Stereo/mono conversion Down/up mixing Nielsen Watermark extraction and injection into HLS ID3 tag Automatic audio leveling control

SUBTITLING

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

DATA

Subtitles	Passthrough
SCTE 35	Maintaining frame accuracy splicing and conversion from SCTE-104

CONTENT PROTECTION

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

ABR (OTT) FEATURES

Origin	Apple HLS v3/v4/v5 MPEG-DASH (including HbbTV 1.5, DVB-DASH, ATSC 3.0 profiles) Microsoft Smooth Streaming CMAF (Common Media Application Format) Catch-up / LLCU (Long Lasting Catch-up) Start-over nPVR Packaging on the fly
Delivery Methods	Pull mode Push mode (POST & WebDAV)
Dynamic Ad Insertion	ESAM compliant

DEPLOYMENT ENVIRONMENTS

Datacenter	Off-the-shelf server
Private Cloud	OpenStack, Mesos, Kubernetes
Operating System	Linux
Control & Monitoring	Web Graphical User Interface RESTFul API