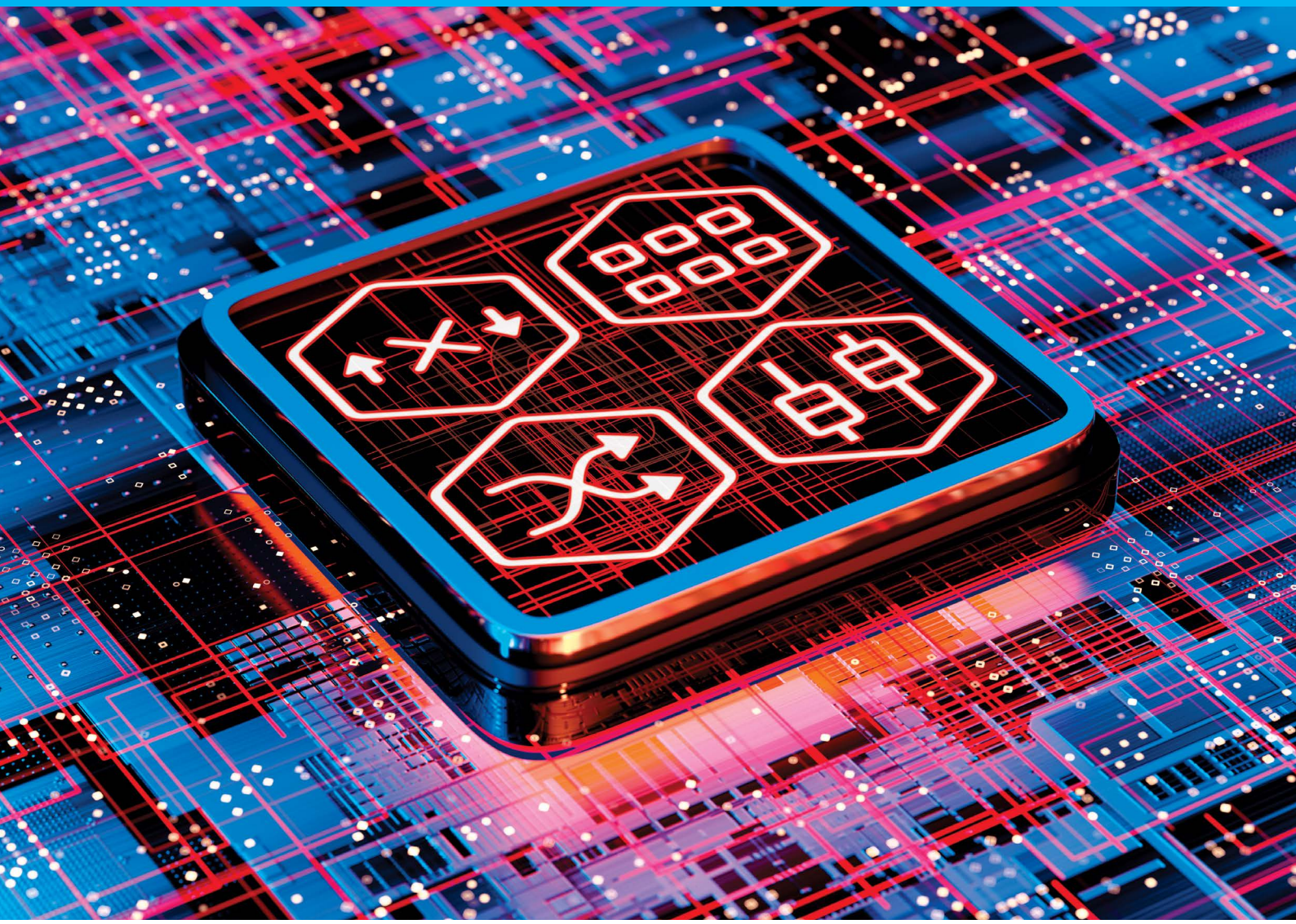
HOME Apps

SERVER-BASED PROCESSING PLATFORM



SPIN UP
SCALE
FLEX

HOME Apps

INTRODUCTION

SIMPLICITY of management delivered through a unified approach.

Maximum asset utilization enabled with AGILE infrastructure design.

Technical and commercial FLEXIBILITY solved.

PROUDLY SUPPORTING:

AIMS · SMPTE ST 2110 · JPEG · NDI · SRT · Dante · lives@HOME

HOME Apps — Think Outside The Box

Most evolutionary steps in the broadcast, AV, house of worship, theater and live sectors have been incremental. But the industry is changing faster than ever before. New delivery channels, a variety of source and destination formats, and ever tighter budget constraints are the new reality.

Five- to ten-year purchasing cycles may be just a little long when planning your next infrastructure overhaul, especially since no-one appreciates a lot of hardware sitting idle for the best part of that period.

This makes it increasingly likely that new formats will emerge that are not supported by the dedicated hardware you own. The only way out of this conundrum is a flexible, instantly scalable processing solution that can run anywhere.

A first set of recommendations published by prominent opinion leaders only weeks before Lawo's HOME Apps were officially introduced emphasized the importance of decoupling processing from the hardware it runs on. Under the "Dynamic Media Facility" moniker, this has been complemented with the expectation that broadcast vendors leave all aspects related to the host platform to vendors that have the heft and expertise to take raw processing power to ever new heights. Broadcast vendors, for their part, need to focus on providing added processing value in the form of agile software apps.

Meet Lawo's HOME Apps—the abstraction of broadcast and media functionality from the hardware that does the compute heavy lifting. When you need it, where you need it, with seamless scalability and a revolutionary commercial model.

The Abstraction of Broadcast and Media Functionality from the IT Hardware that does the Compute Heavy Lifting.

When you need it, where you need it, with a Revolutionary Commercial Model: Lawo FLEX

Microservices for Macro Agility

Select, Configure, Spin Up/Down

Lawo's HOME Apps are modular microservices that cater to a fast growing number of production tasks. They are bound to infuse your operation with a striking amount of agility and flexibility.

Highly popular and impressively effective for both global event coverage and any production environment that requires processing on demand, the current HOME Apps portfolio comprises the following:

- **HOME Multiviewer**
- **HOME UDX Converter with HDR processing**
- **HOME Downstream Keyer**
- **HOME Color Corrector with HDR Processing**
- **HOME mc² DSP**
- **HOME Power Core**
- **HOME Audio Shuffler**
- **HOME Commentary**
- **HOME Video Monitor**
- **HOME Stream Transcoder**
- **HOME Graphic Inserter**
- **HOME Test Pattern/Test Tone Generator (TPG)**
- **HOME Timecode Generator**
- **HOME Delay**
- **HOME mc² crystal Controller**

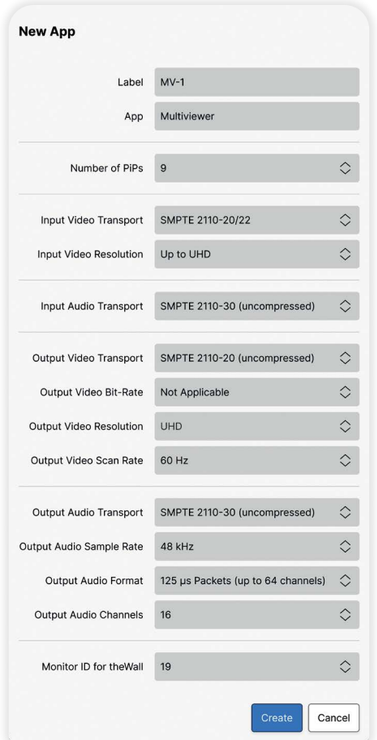
HOME Apps can be spun up and down instantly via HOME's intuitive user interface or VSM, which will conveniently preserve your settings for future use. App usage is based on perpetual licenses for constant, long-term availability, if so desired. Lawo's function-agnostic Flex Subscription model, on the other hand, frees operators from the pressure (and budget constraints) of getting the project planning right for the next five to ten years.

HOME Apps with a built-in Lawo Workspace user interface even allow for untethered, mobile operation, viewing and tweaking—while still leveraging the raw power and boundless flexibility of the HOME Apps' microservice architecture.

Intuitive and Fast

Thanks to the native integration of HOME Apps with the HOME management platform, operators enjoy a straightforward, fast and streamlined user experience. HOME Apps can run when and where they are needed, without any long-winded configuration sessions or expert knowledge.

This has the distinct advantage of freeing up budget credits that can be allocated to other functionality.



Pictured: HOME Multiviewer and theWALL app for easy configuration of world-class, fully-featured multiviewer heads

A Global Success Story

Lawo's HOME Apps were thrown in at the deep end in mid-2023. Today, they can already look back on multiple highly successful projects and events in Australia, New Zealand, the USA, Germany, France and other countries. HOME Apps deliver on their promise to enable world-class content production.

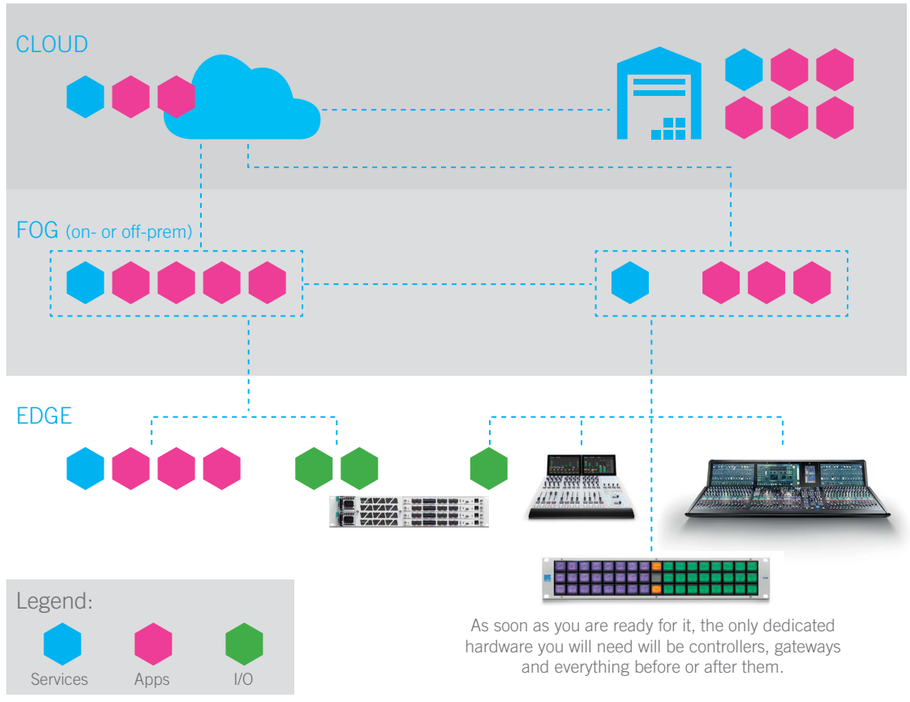
The convenience to use the exact same compute hardware for vastly different tasks clearly appeals to content creators who need to stay agile in the face of rapidly changing requirements. For maximum flexibility, Lawo Flex Subscriptions and the credits they are based on can be used just about anywhere to unleash the power of HOME Apps: on premise, at remote locations, even in OB trucks. In a matter of seconds.

360° FLEXIBILITY

- Run apps on standard servers where it makes most sense: on premise, in private data centers or in the cloud.
- Cater to all formats and requirements at the click of a button.
- Mix and match the SMPTE 2110, NDI®, JPEG XS, SRT, WebRTC* and Dante* protocols on a unified platform.
- Decide for yourself whether and how much to invest upfront.
- Complement your existing hardware pool with software apps.
- Remain nimble despite tight budget control.
- One overarching platform solution caters to all building blocks of your processing infrastructure.

(*) Dante support is a future product development.

The Flexibility to Make it Happen



As soon as you are ready for it, the only dedicated hardware you will need will be controllers, gateways and everything before or after them.

Orchestrated by HOME

lives @ HOME

Lawo's HOME Apps for IP infrastructures are single-purpose applications that run on standard servers. With the exception of the need for a network interface card (NIC), they are completely abstracted from the hardware.

HOME Apps require no proprietary hardware and are orchestrated **in a broad sense**: HOME manages the stream flows, the services, the applications and the processing capacity in a lightning-fast and intuitive way.

This allows operators to start and stop processing services on demand, via a single, unified user interface, without having to worry about what needs to happen in the background.

Call it functionality on demand if you will, presented in such a way that operators remain free to run **containerized apps** on **on-premise servers**, in their **OB trucks**, in a **datacenter** and/or a **public cloud**—whichever makes most sense.

Containers to Instantly Unleash Your Processing Capability

Based on a series of deliberate choices, HOME Apps processing is provided by means of **microservices** running in containers to ensure **maximum agility**. Containers are cloud-native, standalone executable software packages comprising the applications and their dependencies. They run on standard servers and offer the following benefits:

- The ecosystem is based on a modern, agile system architecture;
- Containers and apps are fast to boot;
- Apps and ancillary services (inputs, outputs, delivery formats) can be combined in highly modular ways;
- HOME Apps are easy to scale and are portable;
- They are optimized for performance, memory, energy, and space requirements;
- They operate in isolation (no interference from other apps);
- They are quick to update (short compilation times) and manage: stopping one microservice has no effect on others that may be running simultaneously.

Containers can be moved to most hardware platforms, whether CPU- or both **CPU**- and **GPU***-based, whether **on-prem**, in a **remote datacenter** (fog) or in the **cloud**. They even scale seamlessly to new server generations with more processing power. Plus, HOME Apps command compute resources and energy only when they are in use, which is good news for the environment.

Amid the growing diversity of deliverables and the race towards ever more content, Lawo recognizes the benefits offered by NDI®, SRT and Dante**, and is pleased to support its customers. Lawo's HOME Apps allow broadcasters and media producers to select tailormade tools to tell compelling stories.

INDUSTRY-GRADE NATS CONNECTIVITY

HOME is inherently built on publicly available, open-source technology. It uses the NATS publish/subscribe protocol for industry-grade communication across microservices. All microservices and applications publish to, or subscribe from, NATS.

Being natively scalable, secure and cloud-ready, NATS is one of the fastest and most comprehensive ways to compile and leverage a wealth of information quickly:

- Discovery of new HOME-native devices.
- Understanding a device's capabilities.
- Establishing what essence types a device can receive.
- Dynamically managing a device's control IP addresses and stream multicast addresses.
- Taking stock of the number of senders and receivers a device offers.
- Gathering information about how to control a new software or hardware device.
- Monitoring the devices on the network.
- Querying logs generated by the devices.

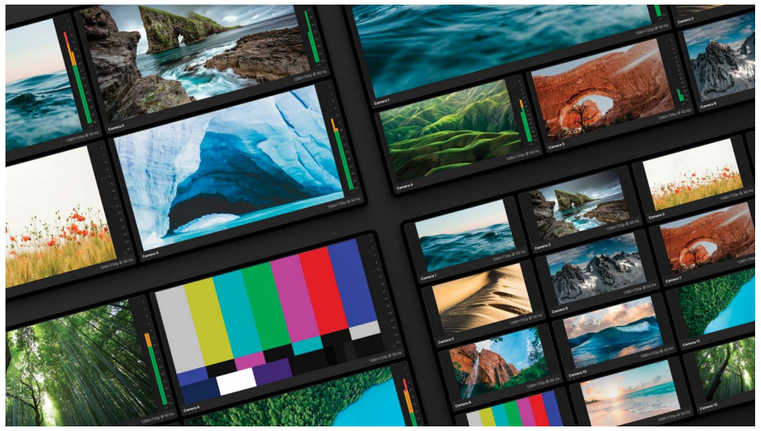
(*) GPU support is a future product development. (**) Dante support is a future product development.

HOME Apps

FIFTEEN ESSENTIAL APPS

HOME Multiviewer

Meet the definitive multiviewer for monitoring UHD, 3G, HD and SD video as well as audio sources, with pixel-perfect mosaics and ultra-low latency for global events and any other agile broadcast and AV operation.



HOME Multiviewer no longer requires dedicated hardware, relying instead on cloud-native technology such as Docker. It is perfectly suited for high-bandwidth/low-latency SMPTE ST2110 broadcast environments, SRT stream workflows in the cloud, NDI devices, compressed formats, and so on.

The number of PiPs can easily be adapted to the job at hand. Going from one to up to 64 splits in a real-world scenario is a simple matter of setting the relevant parameter in HOME which, among many other things, acts as the GUI for all HOME Apps.

Multiviewer layouts—complete with customizable tallies, alarms, clocks, level meters, OSDs, UMDs, closed captions, and metadata—are created with Lawo's intuitive theWALL app, which sits inside the HOME cluster. All settings can be stored as user presets and applied to other HOME Multiviewer instances for a unified look. Most importantly, users don't need to be engineers—nor have a scripting background—to spin up and configure a HOME Multiviewer. The HOME management platform makes everything plain, simple, and intuitive. It even turns the HOME Multiviewer into an intelligent multiviewer!

The HOME Multiviewer app currently natively supports SMPTE ST2110, NDI, SRT, and Dante—with or without JPEG XS, H.265 or H.264 compression. Future format requirements can be accommodated as they become relevant. Input and output formats are specified independently, and the resolution for the second multiviewer output can be set independently. Multi-format input instances can be configured with the HOME Stream Transcoder.

Please ask your Lawo contact for details about the system requirements.

KEY FEATURES HOME MULTIVIEWER

VIDEO

- Frame synchronizer
- Mixed I/O support for ST2110-20 and JPEG XS flows
- SD/HD/.edge proxies: up to 64 PiPs per head, 1080p applications: up to 32 PiPs per head; UHD: up to 8 PiPs per head
- PiPs can be interlaced or progressive

AUDIO

- Audio processing: 16 bits, 24 bits at 48kHz
- 8x ST2110-30 streams x 64 audio channels per PiP, 1 output stream x 16 audio channels per head

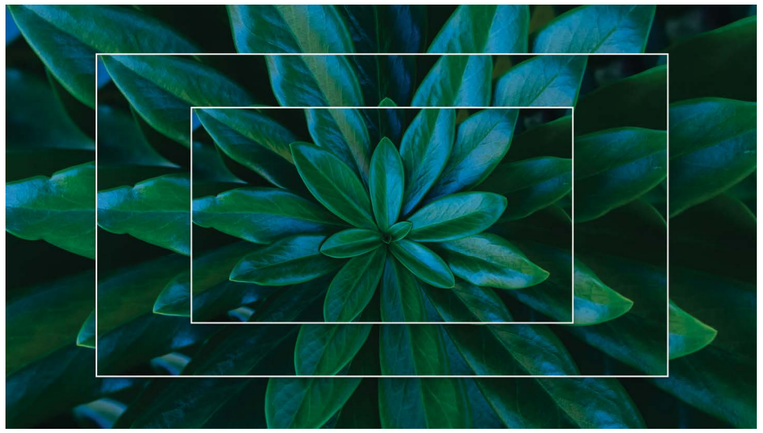
HEAD LAYOUT

- Layout/background color (loaded/saved via theWALL)
- Widgets for a host of informative and decorative elements, UTF-8 support for non-roman languages
- Separate timer service with count-up and count-down

DATA SOURCES

- HOME Tally, TSL Tally (TSL 3.1 and 5.0), Alarm, Audio Levels, Video Standard

HOME UDX Converter (with HDR processing)



HOME UDX Converter with HDR processing provides video format and aspect ratio conversions.

It offers a de-interlacer, an HDR/color processor, a scaler and two outputs. Each output can use a different format with a different overlay, and—where applicable—can be set to "i" or "p". It delivers conversions between SD, HD, 3G and UHD as well as SMPTE ST2110, SRT and NDI® in the HOME Apps ecosystem. One example would be: UHD to both 3G and HD, either with or without graphics, e.g. for simultaneous "clean" feed and "dirty" feed output during global events.

Operators can also perform conversions from one protocol (e.g. ST2110) to another (e.g. SRT) as well as from HDR to SDR, and vice versa, in HLG and PQ using 3D LUT (.cube) tetrahedral interpolation.

HOME UDX Converter natively supports both ST2110-20 and ST2110-22 (compressed) video as well as ST2110-30 and AES67 IP audio streams.

Additionally, HOME UDX Converter features frame synchronization, non-linear edge enhancement, fully flexible audio shuffling, de-interlace/interlace, and HTML5-based graphics overlay.

The HTML5-based feature enables users to create rich 2D/3D HTML5 graphics (with transparent background) using their favorite tools. Simply add the URL to HOME UDX before spinning up the app to overlay these graphics on the UDX output. Color space conversion, finally, supports BT.601/BT.709/BT.2020 with proc-amp color correction control.

KEY FEATURES HOME UDX

VIDEO

- Frame synchronizer
- 3D LUT (.cube) tetrahedral interpolation (HDR <> SDR processing)
- Resolution*: SD, HD, 3G, UHD
- Color space conversion: BT.601/BT.709/BT.2020 with proc-amp and color correction control
- Non-linear edge enhancement
- Optional color correction add-on

AUDIO

- Audio processing: 16 bits, 24 bits at 44.1kHz or 48kHz
- Up to 8x audio streams (send and receive), up to 64 channels per stream
- Fully flexible audio channel shuffling, Audio Channel Return (ARC) control and Delay insertion

GRAPHICS OVERLAY

- HTML5 rendering (transparent background for keying), any HTML source

(*) JPEG-XS only supports the HD, 3G and UHD formats.

HOME Color Corrector (with HDR Processing)

This stand-alone HOME App provides YUV (YCrCb) and RGB color correction functions with an HDR<–>SDR conversion option. A typical workflow that involves HDR conversion provides proc amp corrections in the YCrCb space, after which the information is processed by a matrix that moves it to the RGB color space.

Once there, users can activate the HDR option and assign the required standard or custom 3D LUT. Where necessary, the result can be tweaked with the RGB parameters (see below), and processed by an RGB–>YCrCb matrix to move it back to the YCrCb color space, where YCrCb tweaking can be performed.

Color corrections are also possible on only the YCrCb or the RGB level. Illegal colors are avoided by the application of automatic clipping before the output.

KEY FEATURES HOME COLOR CORRECTOR

VIDEO

- Video input and output formats: SMPTE ST2110-20/22, NDI®, SRT, JPEG XS
- Resolution*: SD, HD, 3G, UHD

YUV (YCrCb) PARAMETERS

- (Y) Luma Gain, Brightness, Chroma Gain & Hue, (Y) Luma Lift, Luma Lift/Gain & Contrast, Saturation, Hue, U-Gain and Offset, V-Gain and Offset

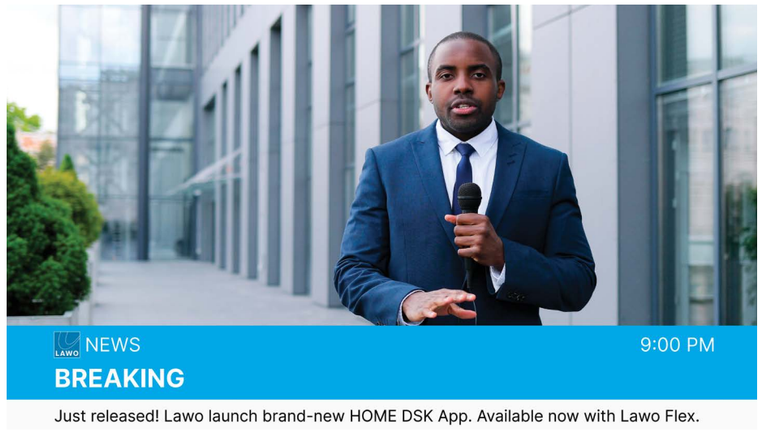
RGB PARAMETERS

- Lift/Gain, Gamma, Gain/Contrast, S-Curve, S–Curve Pivot points, Red – Gamma, Red – Gain Contrast, Red – Lift/Brightness, Red – S-Curve & Curve Pivot points, Same controls for Green & Blue

(*) JPEG-XS only supports the HD, 3G and UHD formats.

HOME Downstream Keyer

HOME Downstream Keyer (DSK) sets a new benchmark in video processing for broadcasters, bringing a higher level of control, flexibility, and compatibility to modern production environments. It is a sophisticated and powerful HOME App for video, with a feature set closer to what a video switcher provides than to what operators expect from a regular downstream keying function.



HOME Downstream Keyer offers comprehensive keying and mixing capabilities to meet production needs and enable additional channel branding within a state-of-the-art, agile infrastructure, based on triggers issued via the VSM control system where desired.

Operators can simultaneously, and independently, transition up to three key layers over an A/B background mix with make-before-break switching.

In addition to six Key and Fill inputs and two background inputs that receive any of the sources available on the network, the app offers two outputs—Program and Preview. The Program output transmits the composition of the selected background and the active Keyers, while the Preview output carries a selectable background source. Users can force the Preview output to show the Program output's background without keys, e.g. for clean-feed applications. HOME Downstream Keyer enables any combination of the background mixer signals and Keyers, including the absence of Keyers for pure mixing purposes.

HOME Downstream Keyer comes with eight ST2110-20 receivers and two ST2110-20 transmitters. Each of the three Keyers can perform Luma, Linear or Self keying for high-end broadcast graphics designed with, or without, transparency and drop shadows.

(*) Dante support is a future product development.

HOME Downstream Keyer can be deployed in both SDR (1080i/1080p) and HDR (UHD) workflows. It supports SMPTE ST2110 (incl. JPEG XS), NDI, SRT, and Dante AV* transport as required. Like all HOME Apps, it can either be licensed perpetually or solicited on an ad-hoc basis through Lawo Flex Subscription credits.

KEY FEATURES HOME DOWNSTREAM KEYER

- Configurable with up to 3 Keyers
- Each key can perform Luma, Linear or Self keying
- A/B Mixer
- Receivers are automatically provisioned for the Keyers
- Up to 6 receivers for 3 Keyers (Key & Fill), 2 receivers for A and B backgrounds
- Key Shaping option for finer key edge processing
- Independent transitions and user-defined transition duration per Keyer (Cut, Fade)
- Supports Tally
- Background Transitions: Cut, Cut > Fade Up, Fade Down > Cut, Fade Down > Fade Up, Cross Fade

HOME Apps

FIFTEEN ESSENTIAL APPS

HOME mc² DSP

Lawo's HOME mc² DSP app is a microservice-based, agile audio engine with the equivalent feature set of the A__UHD Core, but hosted on CPU-based standard servers.

HOME mc² DSP is designed for use in tandem with Lawo's mc² mixing and crystal Controller consoles and is able to instantiate a (virtual) mixing system at the press of a button wherever audio processing capability is required fast—and perhaps unexpectedly.

With all features known from the A__UHD Core FPGA hardware in a completely redesigned CPU-based package, HOME mc² DSP allows operators to spin up mc²-grade audio DSP processing on demand with hitherto unavailable granularity.

HOME mc² DSP fully leverages the agility afforded by the abstraction of processing functionality from the hardware with all the benefits of Lawo's Flex licensing and subscription model: users can freely allocate subscription credits, either locally or system-wide, to any available HOME App—whether audio or video.

Its primary purpose is to provide audio processing in situations where no A__UHD Core is available or where remaining within the HOME Apps realm is more practical. It allows users to spin up a processing core with vastly different channel counts to perfectly match each specific use case.

The HOME mc² DSP app boasts the same ultra-low latency as its hardware companion. All capabilities and features are so similar that operators are unable to tell whether their console surface controls a hardware-based A__UHD Core, or the HOME mc² DSP app. Scaling automatically with future CPU developments, HOME mc² DSP can provide up to several thousand DSP channels where needed, with support for mono, stereo, 5.1, and a host of NGA immersive mixing formats, plus automatic downmixes.

KEY FEATURES HOME mc² DSP

- Runs on CPU with the same latency as A__UHD Core
- mc²-style processing channels (identical to A__UHD Core)
- Up to 2048 Inputs
- Up to 256 AUX busses, 96 Groups, 96 Sums (simultaneously where desired)
- 32 infinite Automix Groups
- Sampling rate: 48kHz, 96kHz
- Virtual Loopbacks (vLoopbacks)
- Support for: mono, stereo, 5.1, immersive audio
- Downmixes for stereo, 5.1 and immersive processing channels
- High-quality AMBIT upmix from stereo to 5.1
- AFL 1: stereo & surround, PFL 1 stereo; AFL 2: stereo, PFL 2 stereo
- Compatible control surfaces: mc² consoles, crystal Controller console, headless mixing systems
- Supported audio formats: ST2110-30 (incl. RAVENNA, AES67), NDI, SRT and Dante*
- Tone generator: Sine, White Noise, Pink Noise, EBU Stereo, BLITS 5.1

(*) Dante support is a future product development.

NEW HOME Power Core

The HOME Power Core app leverages the agility of Lawo's HOME Apps platform to provide instant processing, mixing, routing and monitoring for radio and TV workflows where physical Power Core units are not available, already in use, or impractical. For each application, users can choose among a compact, a large, and an XL instance of the app to make sensible use of the available CPU cores.

In addition to supporting the SMPTE ST2110, RAVENNA, AES67, Dante, NDI, and SRT transport formats, HOME Power Core provides DSP algorithms derived from Lawo's mc² mixing platform for pristine audio quality. Its native NDI and Dante AV routing, encoding, and transcoding capabilities will streamline visual-radio workflows.

While the HOME Power Core app includes a range of out-of-the box configurations for many common on-air applications, operators also enjoy the liberty of creating highly customized configurations using the powerful built-in workflow and logic engine.

HOME Power Core interacts with all I/O sources and destinations connected to the IP network, such as physical Power Core devices, A__line stageboxes, .edge audio streams, Lawo Virtual Soundcards and other RAVENNA, ST2110, AES67 or Dante compliant audio devices. It can be controlled from the modular diamond console, the more compact and versatile crystal console, Lawo's virtual on-air interface—crystal Clear, and Lawo's configurable software UI—VisTool, that complements or replaces a physical human interface.

Like all HOME Apps, HOME Power Core supports both Lawo FLEX Subscription credits, for maximum ad-hoc processing agility, and perpetual licenses for those who prefer to own the app.

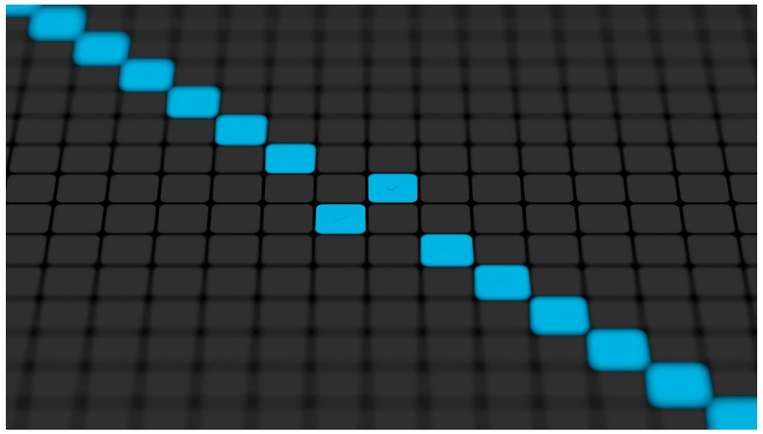
KEY FEATURES HOME Power Core

- Equivalent feature set of the physical Power Core hosted on CPU-based standard servers
- Possibility to host multiple Power Core instances on the same server
- Small, medium or large for optimized resource utilization
- Perfect for space- and energy-saving COTS server usage in centralized datacenters.
- Support for SMPTE ST2110, RAVENNA, AES67, Dante, NDI, and SRT
- Enhanced, mc²-based DSP algorithms
- Brings all the benefits of the Lawo HOME platform to radio and TV workflows, including enhanced security features and robust failover mechanisms
- Seamless integration with Lawo HOME video apps for TV and visual radio applications without external conversion boxes etc.
- Perfect for headless applications or in combinations with compatible control surfaces: Lawo diamond and crystal consoles, crystal Clear and VisTool

HOME Apps

FIFTEEN ESSENTIAL APPS

NEW HOME Audio Shuffler



HOME Audio Shuffler is a flexibly controllable HOME App that replaces a traditional baseband audio matrix on a purely software level. Designed for advanced audio channel remapping and signal processing in audio-over-IP environments and available in six preconfigured matrix sizes, it allows users to repackage incoming audio signals for different applications, to freely compile streams based on audio signals from a variety of sources, and otherwise customize an audio stream's payload. This is especially handy for downstream applications and devices without built-in audio matrix functionality.

Supporting SMPTE ST2110-30 (24 bits) and -31 (32 bits, RAVENNA AM824 payload format with bit transparency), HOME Audio Shuffler conforms to AES67 and ST2110-30 (Levels A, B and C) with minimal latency, while also providing redundancy options via ST2022-7 (Seamless Protection Switching) and the HOME App auto restart mechanism, for reliable 24/7 operation.

Incoming audio streams can be reshuffled and routed to the desired transmitters (IP outputs) using the HOME Terminal Routing Matrix. Stream routing, shuffling, and many other operations can be controlled via any hardware or software panel of a workflow control system such as Lawo VSM that communicates with the required HOME Audio Shuffler instance via the HOME API.

HOME Audio Shuffler is the perfect tool for any audio deployment at scale, such as in master control rooms and any other application requiring a mix of shared (e.g. clean feed) and individually contributed and controllable audio sources.

Offering symmetrical flow sizes between 64 and 2048 RX and TX streams that each accommodate up to 64 audio channels, HOME Audio Shuffler's matrix size can be conveniently selected from six packages. All signal inputs come with essential DSP functionality: Gain, Mute and Polarity for each channel, with minimal latency and full bit transparency.

KEY FEATURES HOME Audio Shuffler

- Up to 16,384 input and 16,384 output signals
- Up to 2048 receivers (RX) and 2048 senders (TX) with up to 64 audio channels each
- DSP functionality: Gain, Mute, Polarity for each channel
- Ultra-low audio latency
- Sample Rate: 48kHz
- Six different matrix sizes:
  64 RX & TX flows (1,024 channels),
  128 RX & TX flows (2,048 channels),
  256 RX & TX flows (4,096 channels),
  512 RX & TX flows (8,192 channels),
  1024 RX & TX flows (12,288 channels),
  2048 RX & TX flows (16,384 channels)
- Supports SMPTE ST2110-30/31 with bit transparency, conforms to AES67, ST2110-30 (Levels A, B and C)

HOME Delay

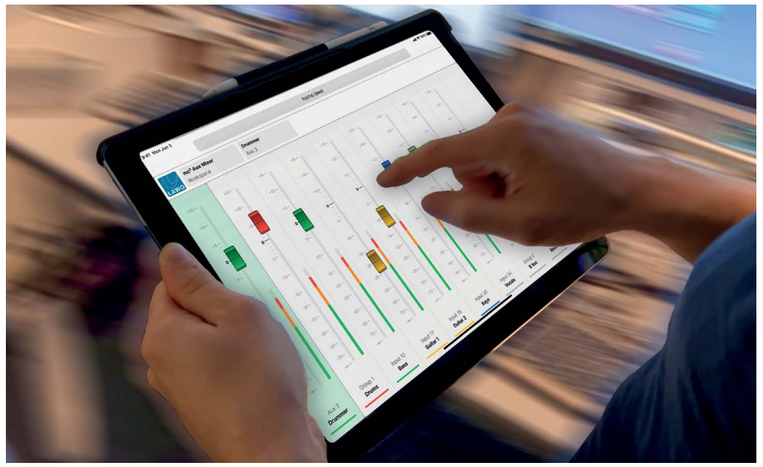
The HOME Delay app allows operators to delay incoming and outgoing essences (video, audio, ancillary) either simultaneously or separately. This is often essential to get all production assets aligned, for system-level synchronization of audio and video, sub-level alignment processes, lipsync issues and to provide profanity delay for live productions.

KEY FEATURES HOME DELAY

- Delays the following incoming and outgoing IP essences:
  1x ST2110-20 (video),
  8x ST2110-30 (audio), and
  1x ST2110-40 (metadata)
- Maximum delay time: 360 frames

Lawo Workspaces

My HOME App is My Workspace



Lawo Workspaces are a novel, mobile approach to working with Lawo's platform-agnostic HOME Apps. They are remotely accessible user interfaces wrapped around modular, microservice-based HOME Apps that provide mission-specific production functionality on the go. With their HTML5-native UI layer, Lawo Workspace-ready HOME Apps can be controlled from any desktop, laptop, tablet, or phone—providing low-latency audio, video, and control via a browser-based user interface.

Lawo Workspaces run on any device, on any OS—anywhere—and automatically adapt to different screen sizes, aspect ratios and orientations. Taking advantage of modern browser media capabilities, they can be used full-screen or picture-in-picture right out of the box.

Lawo Workspace user interfaces are also accessible, supporting resizable text, responsive reflow, and selectable high-contrast variants for both light and dark themes. They are even AR-ready for next-generation headset-based workflows.

Users are free to combine one workspace-savvy HOME App with the information supplied by another, e.g., for audio applications that also require video. A virtual VSM web panel can be embedded directly into the Workspace UI whenever more customization is needed.

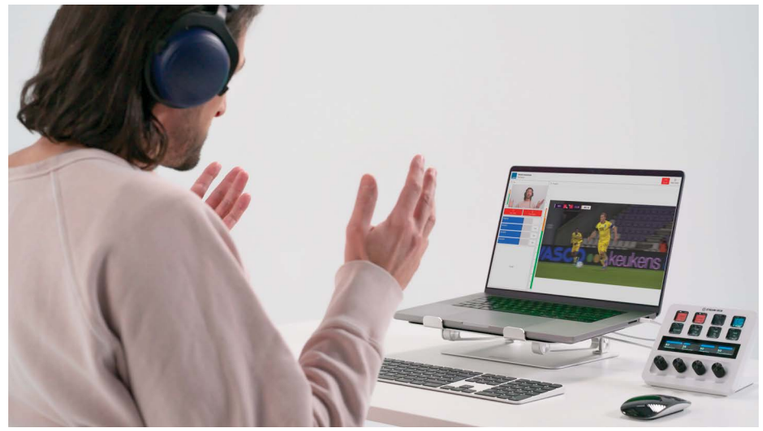
HOME Apps with a Lawo Workspace UI leverage the modular, platform-agnostic architecture of the HOME Apps ecosystem. They combine microservices running on remote generic servers into broadcast-quality applications for workflows on the go. Like all HOME Apps, Lawo Workspace apps are protected by HOME's Authentication and Authorization systems that secure and encrypt all control and media flows.

KEY FEATURES

- HMTL5-based, virtual user interface for desktop and laptop computers, tablets and phones, OS-agnostic
- Adapt to any device, screen size and orientation
- AR-ready for a goggle-based user experience
- Possibility to integrate VSM workflow control
- Secured via HOME Authentication and Authorization, encrypted stream transport

NEW HOME Commentary

WORK SPACE



Even a compact traditional commentary setup is still rather bulky and requires a solid technical background to get users up and running. The HOME Commentary app provides a fresh approach to any commentary scenario, whether off-tube or on-location.

Commentators or contributors can monitor up to 2 videos, send their audio and video to production for contribution or monitoring, and interact with production coordination via a built-in talkback route. In its most compact form, the HTML5-based Lawo Workspace UI built into the HOME Commentary App can be accessed on any laptop, tablet or phone and only requires a microphone and a pair of headphones to get started.

In the event of an issue, an engineer can access the same browser-based workspace to provide tech support from anywhere in the world without first setting up a second line or using dedicated remote control software.

The commentator's coordination mix and talkback are processed in the HOME Apps backend, but can also be controlled directly from the Workspace UI.

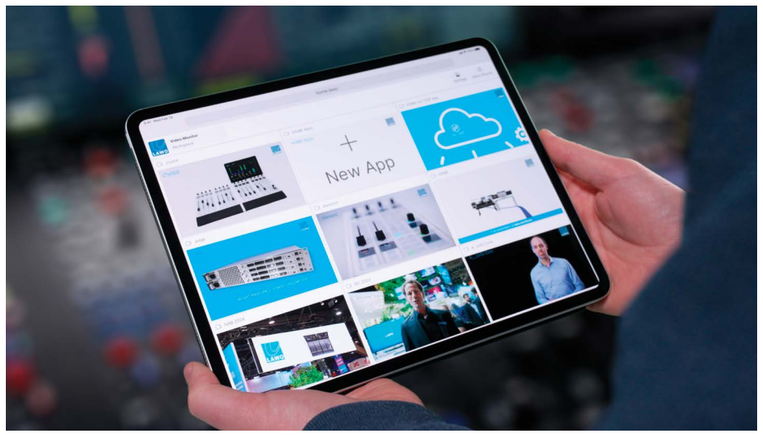
While commentators are free to use a high-end audio gateway for top-tier events, remote commentary jobs can also be handled with a USB-C microphone to which a pair of headphones is connected, and the host device's built-in camera. The HOME Commentary app delivers all-in-one commentary in its most intuitive form with a proven track record at global events.

KEY FEATURES HOME Commentary

- HMTL5-based user interface, OS-agnostic
- Reliable video and audio monitoring, contribution, and platform-managed tech support
- Adapts to any device, screen size and orientation
- Requires only a microphone and a pair of headphones for small assignments, supports audio interfaces and high-quality video cameras
- Secured via HOME Authentication and Authorization, encrypted stream transport
- Commercial flexibility through Lawo FLEX

NEW HOME Video Monitor

WORK SPACE



The HOME Video Monitor app delivers low-latency video and audio to any location, on any device. Designed for broadcast and AV professionals with a million things to do, this HTML5-based app for laptops, mobile devices, and AR goggles is a light-weight solution for heavy-duty video monitoring tasks.

Capable of showing between one and nine concurrent video streams, with and without audio metering, this HOME App boasts a highly responsive design. Just tap and choose a source—all routing in the background is handled transparently by HOME. For tweaks to the workflow, a VSM web panel can be integrated directly in the Workspace UI to leverage the power and flexibility of the most comprehensive broadcast control system.

The modularity of the HOME Apps platform has allowed Lawo to equip the HOME Video Monitor app with a transcoding function: just route the required sources to the app and watch them appear in the selected PiP frames. If a source is already in the expected format (WebRTC), users can skip the transcoding stage and leverage that unused processing power for other tasks.

HOME Video Monitor natively supports both full-screen and picture-in-picture display, allowing users to keep an eye on their content while working in another app or Lawo Workspace.

KEY FEATURES HOME Video Monitor

- HMTL5-based user interface, OS-agnostic
- Reliable video monitoring for broadcast, AV and other applications
- Adapts to any device, screen size and orientation
- Bundled with a stream transcoder to support multi-format video sources
- AR-ready for a goggle-based user experience
- Possibility to integrate VSM control
- Commercial flexibility through Lawo FLEX
- Secured via HOME Authentication and Authorization, encrypted stream transport

NEW HOME mc² crystal Controller

WORK SPACE

The HOME mc² crystal Controller app is the missing link for mixing scenarios where compact crystal consoles complement a large mc² audio control surface operated by the A1.

So far, audio teams were able to choose between an eight-fader crystal and a six-fader model with a host of assignable buttons and controls to assist the main audio supervisor working on an mc² console. Although this was a major breakthrough when it was first announced, such a workflow relies on the fact that all sound engineers are in the same location: an audio control room, adjacent galleries or in the hall where the audio can be monitored via the sound reinforcement system.

Truly distributed mixing scenarios from different locations, however, used to require a fair amount of audio and video infrastructure in addition to a compact crystal console. With HOME mc² crystal Controller, a virtual extension, or a tablet or laptop placed behind it can display high-resolution audio meters and a video feed for the project operators are working on. The audio received by the app can also be monitored using compact active monitor speakers or headphones connected to the host device.

HOME mc² crystal Controller and its Workspace UI are a momentous step for the convenience of IP-networked workflows that involve distributed secondary or unobtrusive primary mixing positions: this app allows talented sound engineers to work from an assigned location or their hotel room before or after an on-location assignment.

KEY FEATURES HOME mc² crystal Controller

- HMTL5-based user interface, OS-agnostic
- High-resolution audio metering, video monitor function, access to more mixing functions, and convenient audio monitoring
- Perfect for broadcast, AV and live events
- Adapts to any device, screen size and orientation
- Only requires a pair of headphones for compact workflows
- AR-ready for a goggle-based user experience
- Secured via HOME Authentication and Authorization, encrypted stream transport
- Commercial flexibility through Lawo FLEX

HOME Stream Transcoder

The HOME Stream Transcoder app allows operators to convert incoming video streams of a given format to one of the supported output formats. It is the perfect tool for a variety of applications.

HOME Stream Transcoder is a precious tool for a variety of applications: transcoding content to the required delivery or transport format; stream preparation for dedicated hardware processors that do not support the source's video format; and—more importantly—signal compression (or decompression) before (or after) long-haul WAN stream transport.

The following input and output formats are supported: SMPTE ST2110, NDI®, SRT, JPEG XS, and Dante.

KEY FEATURES HOME STREAM TRANSCODER

VIDEO

- Video input and output formats: SMPTE ST2110-20/22, NDI®, SRT, JPEG XS and Dante**
- Resolution*: SD, HD, 3G, UHD

AUDIO

- Audio processing: 16 bits, 24 bits at 44.1kHz or 48kHz
- Up to 8x audio streams (send and receive), up to 64 channels per stream
- Flexible audio channel router

(*) JPEG-XS only supports the HD, 3G and UHD formats. (**) Dante support is a future product development.

HOME Timecode Generator

HOME Timecode Generator is a standalone application that generates timecode signals for infrastructure timing needs. The signals are output as ST2110-40 streams for use anywhere on the network. This allows customers to sync all required endpoints, such as cameras used to record ISOs, based on a timecode that can be different from the house clock.

All timecodes generated by the app are based on the PTP signal that is used to sync the app.

KEY FEATURES HOME TIMECODE GENERATOR

GENERATED TIMECODES

- UTC Time, PTP Time, Freerun, Input LTC, Input VITC

OTHERS

- Up to 8 different ST2110-40 timecode feeds are possible per Timecode Generator Instance
- Detailed offset parameter settings

HOME Apps

FIFTEEN ESSENTIAL APPS

HOME TPG

All users of the HOME Apps platform are entitled to a free test pattern generator for video, and a free test tone generator for audio.

HOME Test Pattern/Test Tone Generator assigns 10 fixed outputs to these generators.

KEY FEATURES HOME TPG

Test Pattern Generator (static and moving)

- Wide range of test patterns, including flat-field versions for all supported resolutions

Audio Test Tone Generator

- 48kHz/24-bit test tone, incremental frequencies; Channel 1= 200Hz, channel 2= 400Hz~4 kHz; up to 64 channels
- Test Pattern/Tone Generator Output Allocator
- 10 outputs dedicated to TPG/TTG; any output and any test pattern

HOME Graphic Inserter

The HOME Graphic Inserter app allows operators to turn 2D or 3D animated graphics into video streams.

Simply add the URL of your HTML5 graphic, pick your output resolution and specify the required output format.

The following input and output formats are supported: SMPTE ST2110, NDI®, SRT, JPEG XS, and Dante.

KEY FEATURES HOME GRAPHIC INSERTER

GRAPHICS INSERTION

- HTML5 (transparent background)

VIDEO

- Video output formats: SMPTE 2110-20, NDI®, SRT, JPEG XS, and Dante
- Resolution: SD, HD, 3G, UHD

Broadcast-Grade Protocol Support

Lawo's HOME Apps interface with all widely used protocols, allowing operators to adapt their equipment pool to the production at hand. Additional refinements of these preliminary specifications will be communicated as they become available.

SMPTE Specifications

STANDARDS

- SMPTE 2110 Professional Media Over Managed IP Networks:
- ST2110-10: System Timing and Definitions
- ST2110-20: Uncompressed Active video
- ST2110-21: Traffic Shaping and Delivery Timing for Video
- ST2110-22: Constant Bit-Rate Compressed Video
- ST2110-30: PCM Digital Audio (Levels A, B & C)
- ST2110-40: SMPTE ST291-1 Ancillary Data

ADDITIONAL SUPPORT

- SMPTE ST2022-7: Seamless Protection Switching (Class A & B)

REFERENCE STANDARD

- IEEE1588 (PTPv2)

SUPPORTED FORMATS

- SD: 525i59.94 (NTSC) and 625i50 (PAL)
- HD: 720p50, 720p59.94, 720p60, 1080i50, 1080i59.94, 1080i60
- 3G: 1080p50, 1080p59.94, 1080p60
- 12G: 2160p50, 2160p59.94, 2160p60

MANAGEMENT AND MONITORING (Server connectivity)

- In-band Control via 2 x QSFP28 (100GbE) interfaces
- Out-of-band Control via 1GbE Interface
- API protocol: Lawo HOME

DATA FORMAT

- 10-bit 4:2:2 YCbCr

JPEG XS Specifications

SUPPORTED FORMATS

- HD: 720p50, 720p59.94, 720p60, 1080i50, 1080i59.94, 1080i60
- 3G: 1080p50, 1080p59.94, 1080p60
- 12G: 2160p50, 2160p59.94, 2160p60
- Interlaced formats (1080i50, 1080i59.94, 1080i60) are supported

DATA FORMATS

- 16-bit 4:2:2 YCrCb
- 10-bit 4:2:2 YCrCb (decode only)

NDI® Specifications

STANDARDS

- NDI
- NDI-HX2 (H.264)
- NDI-HX2 (H.265)

SUPPORTED FORMATS

- SD: 525i59.94 (NTSC)* and 625i50 (PAL)*
- HD: 720p50, 720p59.94, 720p60, 1080i50*, 1080i59.94*, 1080i60*
- 3G: 1080p50, 1080p59.94, 1080p60
- 12G: 2160p50, 2160p59.94, 2160p60

DATA FORMATS

- P216 16-bit 4:2:2 YCbCr
- UYVY 8-bit 4:2:2 YCbCr (decode only)
- PA16 16-bit 4:2:2 YCbCR, alpha discarded (decode only)

CONTROL

- NDI v6 SDK support
- Possibility to route registered NDI devices into HOME Apps

SRT Specifications

STANDARDS

- MPEG-TS
- H.264, H.265/HEVC
- Accelerated via GPU (optional)

SUPPORTED FORMATS

- SD: 525i59.94 (NTSC) and 625i50 (PAL)
- HD: 720p50, 720p59.94, 720p60, 1080i50, 1080i59.94, 1080i60
- 3G: 1080p50, 1080p59.94, 1080p60
- 12G: 2160p50, 2160p59.94, 2160p60

DATA FORMATS

- 8-bit 4:2:0 YCbCr

The Perfect Hardware Companion

lives@HOME Lawo FLEX

.edge's compact 2RU housing accommodates up to 192 HD-BNC connectors for SDI and MADI* interfacing and can be clustered to provide matrices well beyond 1152 x 1152 crosspoints. Your next large SDI router can be IP-native, 24RU small, consume only 24x 100G network ports**—a third of what other offerings require—and still be more powerful, scalable and future-proof.

Support for the SMPTE ST2110 suite of standards with SMPTE ST 2022-7 redundancy is built in, providing not only advanced essence-based handling, but also ensuring seamless protection switching of audio, video and ancillary data streams in both local and wide-area network operations.

Basic video and audio processing functions come as standard, whilst power-user features can be added as and when you need them—even for a limited time, thanks to Lawo Flex Subscription credits.

The HOME-native .edge unit is one of the only gateway solutions to boast high-capacity symmetrical IP ingress and egress, providing the sender and receiver count you expect from an IP pro.

Best of all: each .edge unit can be placed close to the sources and destinations users need to connect—and still be part of a planet-spanning network.

.edge KEY FEATURES

- IP-native virtualized, highly modular SDI routing system, based on high-capacity generic compute processing blades.
- Generation of three proxies (1/4, 1/16, 1/64 the original input footage size) for intelligent multiviewer applications in combination with HOME Multiviewer.
- Included and licensable audio and video processing functions.
- Supports SD, HD and UHD input as well as output.
- Compact footprint, lightweight, low power requirements.
- Software-defined, flexibly licensable features for budget-effective performance.
- Hardware/software bundles for easy, out-of-the box SDI router replacement.
- HOME-native, with operator- and expert-level parameter control and more for time-critical, intuitive operation. Ember+ and REST API control support.
- High-density IP conversion for SDI equipment (up to 192 SDI connectors per 2RU).
- Designed for (de)centralized, distributed, remote, and cloud operation.
- Fully based on open industry standards: ST2110, ST2022-7, RAVENNA, AES67, and more.

HOME Apps

SERVER-BASED PROCESSING PLATFORM

Carbon neutral
Print product
ClimatePartner.com/12518-1907-1001

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