HOME Apps Server-based processing platform







HOME Apps INTRODUCTION

SIMPLICITY of management delivered through a unified approach.

Maximum asset utilization enabled with **AGILE** infrastructure design.

Technical and commercial **FLEXIBILITY** solved.

HOME Apps — Think Outside The Box

With the exception of the world's first IP-native processing platform, launched in 2015, 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 anywhere. channels, a hybrid variety of source and destination formats, and ever tighter budget constraints are the new reality. Five- to ten-year Meet Lawo's HOME Apps-the abstraction of broadcast and media purchasing cycles may be just a little long when planning your next functionality from the hardware that does the compute heavy infrastructure overhaul, especially since no-one appreciates a lot of lifting. When you need it, where you need it, with a revolutionary hardware sitting idle for the best part of that period. commercial model.

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 a Revolutionary Commercial Model.

PROUDLY SUPPORTING:









JPEG







Chances are that new formats will emerge which are not supported by the dedicated hardware you own. Purchasing more bespoke hardware that may be obsolete faster than we like, simply no longer makes sense. The only way out of this conundrum is a flexible, instantly scalable processing solution that can run

Microservices for Macro Agility

Select, Configure, Spin Up/Down

HOME's three existing pillars—Connectivity, Security and Management—are joined by a fourth building block—Processing that will future-proof your operation and infuse it 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 conversion with HDR processing
- HOME Stream Transcoder
- HOME Graphic Inserter
- HOME mc² DSP
- HOME Test Pattern/Test Tone Generator (TPG)

HOME Apps can be spun up and down instantly via HOME's intuitive user interface, which will conveniently preserve your settings for future use. App usage is based on permanent licenses for constant, long-term availability, if so desired. The Lawo 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.

Intuitive and Fast

Thanks to the native integration of Lawo's apps with HOME, 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 spent on other functionality.

	5	
Label	MV-1	
Арр	Multiviewer	
Number of PiPs	9	\$
Input Video Transport	SMPTE 2110-20/22	\diamond
Input Video Resolution	Up to UHD	\diamond
Input Audio Transport	SMPTE 2110-30 (uncompressed)	\$
Output Video Transport	SMPTE 2110-20 (uncompressed)	\diamond
Output Video Bit-Rate	Not Applicable	\diamond
Output Video Resolution	UHD	\diamond
Output Video Scan Rate	60 Hz	0
Output Audio Transport	SMPTE 2110-30 (uncompressed)	\$
Output Audio Sample Rate	48 kHz	\$
Output Audio Format	125 µs Packets (up to 64 channels)	\diamond
Output Audio Channels	16	\diamond
Monitor ID for theWall	19	\$



A Global Success Story

Lawo's HOME Apps were thrown in at the deep end in mid-2023. They can already look back on two highly successful global events in Australia, New Zealand and France—well before the HOME Apps processing platform was officially released. More big events are planned for 2024, which goes to show that HOME Apps deliver on their promise to make the lives of operators easier.

The convenience to use the exact same compute hardware for vastly different tasks clearly appeals to content crafters 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.

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

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 and SRT 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 the building blocks of your processing infrastructure.

The Flexibility to Make it Happen



Orchestrated by 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.

lives @ HOME

This allows operators to solicit, and spin down, services on demand, via a single, unified user interface, without having to worry about everything that 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;
- They are easy to scale and are portable;
- They are optimized for performance, memory and space requirements;
- They operate in isolation (no interference from other apps);
- They are quicker to update (short compilation times) and manage: switching off 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**. 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[®] and SRT, and is pleased to support its customers in search of the right production tools for the job at hand, enhancing their functionality with unbridled Lawo expertise.

Thanks to their support for NDI[®] and SRT, in addition to SMPTE ST2110, JPEG XS, and H.26x, Lawo's HOME Apps allow broadcasters and media producers to select the perfect tools to tell compelling stories from the largest possible pool.

INDUSTRY-GRADE NATS CONNECTIVITY

HOME is inherently built on publicly available, opensource 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.

HOME Apps SIX ESSENTIAL APPS

Big 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, 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 this plain, simple, and intuitive.

The HOME Multiviewer app currently natively supports SMPTE ST2110, NDI and SRT—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 can be specified independently. Multi-format input instances can be configured with the HOME Stream Transcoder.

KEY FEATURES HOME MULTIVIEWER

VIDEO

- Frame synchronizer
- 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
- 1 stream x 16 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

DATA SOURCES

HOME Tally, TSL Tally (V3.1/5.0), Alarm, Audio Levels, Video Standard

↔ HOME UDX (with HDR processing)



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

AUDIO

- Audio processing: 16 bits, 24 bits at 48kHz or 96kHz
- Up to 4 x audio streams (send and receive), up to 64 channels per stream
- Fully flexible audio channel shuffling

GRAPHICS OVERLAY

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

A member of the first batch of agile HOME Apps, the HOME UDX Converter with HDR processing provides video format and aspect ratio conversions.

The HOME UDX Converter 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.

The HOME UDX Converter natively supports both ST2110-20 and ST2110-22 (compressed) video as well as ST2110-30/-31, AES67 and RAVENNA IP audio streams.

Additionally, the 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.



HOME Stream Transcoder

OBE Graphic Inserter



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. The 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; andmore 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, and JPEG XS.

KEY FEATURES HOME STREAM TRANSCODER

VIDEO

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

AUDIO

- Audio processing: 16 bits, 24 bits at 48kHz or 96kHz
- Up to 4 x audio streams (send and receive), up to 64 channels per stream
- Flexible audio channel router

The HOME Graphic Inserter app allows users 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 output formats are supported: SMPTE ST2110, NDI[®], SRT and JPEG XS.



KEY FEATURES HOME GRAPHIC INSERTER

GRAPHICS INSERTION

• HTML5 (transparent background for keying)

VIDEO

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

HOME Apps SIX ESSENTIAL APPS

NEW I HOME mc² DSP

Lawo's HOME mc² DSP is a microservicebased 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 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 mc²grade 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 systemwide, 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 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
- Up to thousands of DSP channels, depending on CPU core availability
- Direct audio I/O routing
- mc²-style processing channels (identical to A_UHD Core)
- Mono, stereo, 5.1, and immersive support, configurable number of busses (AUX, GRP, SUM) and input channels





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.

An application that assigns 10 fixed outputs to these generators is included.



KEY FEATURES HOME TPG

- Test Pattern Generator (static and moving)
- Six separate (SDR) test patterns (in all formats)—75% bars, 100% bars, SMPTE bars, zone plate, 75% Tartan bars, 100% Tartan bars
- 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

Meet Lawo Flex

Lawo Flex is a licensing model that caters to **three budget strategies**: Perpetual licenses, Flex Subscriptions, and a user-definable mix of both.

Perpetual Licenses

Some users prefer to **own** the processing functionality they use. This remains possible for HOME Apps, via perpetual licenses for a specific application. Users who want to leverage two or more different HOME Apps are free to purchase several perpetual licenses for unlimited use.

This **corresponds to purchasing** dedicated, bespoke hardware like before, with a **flexible twist**: many HOME Apps allow using a variable number of inputs and/or outputs, depending on the required scale. Permanently licensing three HOME Multiviewers with 6 inputs each would also allow operators to use 12 inputs for one HOME Multiviewer instance, 4 for the second and 2 for the third.

Lawo Flex Subscriptions

Lawo Flex also comprises time-limited subscriptions for processing functionality operators may only need every so often. Originally developed for HOME Apps, they also unlock options on hardware devices such as .edge, and for the HOME platform itself.

Unlike perpetual licenses, Flex Subscriptions provide an **elastic**, entirely customer-centric usage model. With these credits, customers get access to credits that can be allocated on demand to any function—any time, in any system. Not only is it possible to use processing capability only while it is really needed—thus avoiding long-term investments in functionality that is mostly idle the Lawo Flex Subscription model furthermore provides access to all HOME Apps and add-ons (inputs, outputs, formats, etc.) available today and in the future.



FOUR KEY FEATURES OF LAWO FLEX SUBSCRIPTIONS

Peak-Demand Coverage

Lawo Flex addresses peak demand over limited periods without the need to plan ahead extensively. It combines cost control with functional flexibility.



Location-Agnostic The Lawo Flex subscription program entitles customers to share flexible activations across all systems managed through their account.

Why is Lawo Flex a Good Thing?

- Lawo's Perpetual Licenses and Flex Subscriptions can be combined in any way operators see fit, for a highly elastic usage model. One real-world example would be to license a HOME Multiviewer app with six PiPs (i.e., inputs) on a perpetual basis, and to expand its capacity to 12 or even more PiPs with a Flex Subscription for the duration of more demanding assignments. The same principle applies to the number of HOME App instances that are required on a daily basis versus peak-time needs, as well as to functionality operators only need sporadically.
- A Lawo Flex Subscription allows operators to use one HOME App in the morning, another in the afternoon, and yet another in the evening—on the exact same budget. The budget even covers licensable functionality on Lawo hardware and inside HOME.



Function-Agnostic

Lawo Flex credits are not linked to specific functionality. They allow customers to activate functionality any time and without Lawo getting involved.



All-In

The flex processing offering keeps growing. Once released, any new functionality becomes immediately accessible via Lawo Flex credits.

- Lawo continually expands its functionality offering. Any new or previously released functionality can be conveniently leveraged via Flex Subscriptions. In this way, your software and hardware infrastructure's capabilities can grow, shrink and change necessary. Your investment is secure.
- HOME Apps (or rather the credits provided by Flex Subscriptions) can be "moved around": from the production hub to an OB truck, among OB trucks, to remote locations, etc.—wherever they are needed.

THE FLEX VALUE PROPOSITION

While the Perpetual License scheme can be complemented with an optional SLA to preserve access to updates and upgrades, this perennial dimension is already baked into Flex Subscriptions: the offering can keep growing at no extra cost.

HOME Apps PROTOCOL SUPPORT

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:
- ST2210-10: 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)

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

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)

(*) NDI only (not NDIIHX2)

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
- 10-bit 4:2:2 YCbCr (decode only)
- 12-bit 4:2:0 (decode only)

HOME Apps

HOME Apps: Processing On Demand

The Perfect Hardware Companion

.edge — Hyper Density as a Service



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.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 planetspanning network.

(*) Licensable option - future product development. (**) Calculation based on 1152 x 1152, 1080i format and non-redundant operation.



edge KEY FEATURES

- IP-native virtualized, highly modular SDI routing system, based on high-capacity generic compute processing blades.
- Supports SD, HD and UHD input as well as output.
- Compact footprint, lightweight, low power requirements.
- Software-defined, flexibly licensable features for budgeteffective 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.

HOMEApps **SERVER-BASED PROCESSING PLATFORM**

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