

# AudioTools® Server

## Modules Specifications



MINNETONKA AUDIO®  
Telos Alliance

# AudioTools Server Modules Specifications

## AudioTools Server

---

AudioTools Server is an enterprise-level software platform providing seamless, end-to-end audio processing capabilities for media, broadcast, and post-production facilities.

### Use Cases

AudioTools Server provides comprehensive solutions for use cases such as Loudness Control, Audio Quality Control, Metadata Quality Control, Channel Management, Upmixing, Downmixing, Audio Program Management, Dolby® E Automation, NextGen TV Workflows including Dolby Digital Plus Atmos® and MPEG-H, Watermarking, and Frame Rate Conversion amongst others. AudioTools Server can be configured on a single machine or in a multi-node load-balanced environment.

### AudioTools Server

The core module is AudioTools Server. The server runs as a Windows service, deployed on a Microsoft Windows PC. Supported versions of Windows include Windows Server 2012 R2, Windows Server 2016, Windows Server 2019, and Windows 10 Pro. AudioTools Server performs media-handling and audio processing according to the processing modules and parameters specified in the job or workflow XML. The server executes jobs and workflows and communicates their status to any clients polling the server through its SOAP or RESTful web services API.

## Licensing

---

AudioTools Server is a fully modular platform. All functionality modules are technically included with the AudioTools Server installation and license activated using licenses on a CodeMeter USB dongle. AudioTools Server's module licenses are available for multiple concurrent instances or limited to one concurrent instance, and licenses can easily be upgraded if needed. For facilities that need the full power of the AudioTools platform, but do not have demanding throughput requirements, AudioTools Server hence offers an affordable entry level configuration, scaled to meet any enterprise requirement and budget.

### LicenseServer & LicenseConnector

The optional AudioTools LicenseServer is a flexible licensing option that allows for floating licenses across multiple AudioTools Servers, including VM or cloud deployments. To connect to an AudioTools LicenseServer and to use AudioTools licenses hosted from that server, AudioTools Server uses AudioTools LicenseConnector. Available instances of the installed licenses can be shared across all connected AudioTools Servers. For pool licensing, add one LicenseConnector license per AudioTools Server machine.

As an entry level configuration, LicenseServer ONE can be used to host licenses for a single concurrent AudioTools Server node. LicenseServer ONE can be upgraded to the full LicenseServer, supporting multiple instances of LicenseConnector, at any time. All LicenseServer nodes can, as an alternative, be licensed using dongle-free CodeMeter software licenses, rather than CodeMeter USB dongles, to allow for VM or cloud deployment.

## Jobs & Workflows

---

AudioTools jobs are specified in XML and define units of work. A job defines one or more assets to work on, as well as one or more processing modules to apply to those assets. The job XML specifies all processing parameters such as loudness control parameters, or Dolby E encoding metadata. AudioTools workflows are also specified in XML and can execute any number of jobs against an asset. Workflows enable conditional, exceptional, parallel, and iterative processing of audio content, as well as load-balancing across multiple nodes. Workflows provide a simple programming syntax for controlling jobs, parsing job results, setting job parameters, and controlling high-level workflows. See the AudioTools Workflow Control module description for more details.

## AudioTools Server Web Services

---

The web services API provides a SOAP or REST interface to AudioTools Server. The server provides interfaces to job and workflow management, including:

Submit/RemoveJob, ChangeJobPriority/State, GetJobList/XML, Set/GetConcurrentJobs, etc.

SubmitWorkflow, RemoveCompletedWorkflow, GetNodeList, GetWorkflowList/XML, Set/GetNodeState, GetWorkflowParameter etc.

## Client Applications

---

Clients submit jobs or workflows to the server and monitor their status via a well-documented web services interface. AudioTools Server ships with the AudioTools Queue Control client application. Third-party applications may communicate with AudioTools Server via either SOAP or REST interfaces. Third-party applications may be deployed on any supported platform, including but not limited to Windows, Linux, and Mac OS. The AudioTools web services interface is part of the AudioTools Server license.

## AudioTools WebClient

The AudioTools WebClient allows users to monitor AudioTools Server workflows and jobs in any browser, on any device with network access to the AudioTools Server system, without requiring Administrator's access. The WebClient shows the state of all running processes, measurement results as configured in the workflows, and execution log entries. The WebClient can also be used to submit new workflows to the server, or to stop executing workflows.

## AudioTools Operator

The AudioTools Operator application is ideal for simple manual operations and can be used in conjunction with, or instead of, any other method used to drive AudioTools Server. AudioTools Operator enables direct editing of workflow parameters from within the user interface, allowing easy manipulation of targets and other functions prior to submitting a job. The parameter configuration window is dynamically built, defined by the underlying workflow XML, meaning that the exposed parameters are entirely customizable based on the processing requirements and level of access that the users should be allowed to have. The application can be used both to manually submit individual files and to configure Watch Folders. The 3rd Generation of Operator introduces a brand new user interface and a whole host of workflow management options, providing a flexible and user-friendly approach to complete any adaptation task. AudioTools Operator can be used on any Windows-based system with network access to the AudioTools Server system.

## AudioTools WorkflowEditor

AudioTools WorkflowEditor is a flexible tool for setting up and configuring AudioTools Server workflows. The software comes pre-installed with a comprehensive selection of over 1000+ workflow templates, covering most common workflow types and featuring all aspects of AudioTools Server processing. Each template is displayed and can be configured through the software's graphical interface, allowing operators to visualize and edit workflow parameters of each processing step, as well as global workflow settings like storage locations. Preset management tools allow operators to save and recall conformed workflows in a user defined library for quick and simple access. A search option allows operators to quickly find the workflow template that best matches the current requirement. Jobs and watch folders can be submitted to the server for processing directly from the WorkflowEditor, or workflows can be exported for submission via third party tools or web services integration.

## Watch Folders

AudioTools Server can run an unlimited number of watch folders for different sorts of operations. Watch folders can act on assets dropped into the watch folder, which are then processed as defined by the job or workflow XML that is associated with the folder. Instead of the actual media files, Windows short-links referencing their path can be dropped into the folder. As another option, job or workflow XML files, readily configured with media file paths and processing instructions, can be dropped into a watch folder, and will be executed by the server. The latter approaches support watch folder operation without requiring full asset copying into the watch folder.

## Vantage AudioTools Connector

The Telestream Vantage Connector for AudioTools integrates within the Vantage file-based framework to drive audio processing workflows and jobs directly from the Vantage domain through the AudioTools Server or AudioTools FOCUS Server web services API.

The Vantage AudioTools action is available from the tools palette of the Vantage Workflow Designer application and can be configured with both fundamental loudness control workflows and custom workflows, exposing parameters - bindable to Vantage variables - as needed, including the option to generate result variables during runtime of the AudioTools workflow and return them to the Vantage workflow.

## AudioTools Workflow Control

---

The AudioTools Workflow Control layer enables AudioTools Server to act as a high-level business logic automation engine. Workflows can drive any number of AudioTools processors in a logical flow and tie together the logic between them. Workflows apply conditional, exceptional, parallel, or iterative logic to achieve highly complex business processes in an automated environment.

AudioTools Workflows are defined in XML syntax and describe the overall processing organized in steps. Workflow steps can execute jobs that call a processing module, retrieve job results, program job and processing module parameters based on calculations, test parameters, modify workflow state, and call utility functions, such as Windows file operations or execution of external command line applications.

Workflow steps can also execute workflows. These child workflows can encapsulate entire, complex processes, that can be chained as building blocks in an otherwise less complex parent workflow, making it easier to integrate into third party workflow orchestration systems, to maintain or to repurpose. AudioTools Workflow Control can be the invisible decision engine that is running in the background, or it can be used as a powerful profile development platform for the most sophisticated processes.

In addition to process control, the AudioTools Workflow Control layer provides load-balancing of multiple AudioTools Server and qualified external processing nodes. AudioTools Workflow Control communicates with other nodes on the network to negotiate resource availability and ensure nodes are optimized based on performance and license availability.

Note that each AudioTools node using Workflow Control based processing and profiles must be licensed for the Workflow Control module.

## Processing and Solutions Modules

### Processing Modules

- AudioTools Loudness Measurement
- AudioTools Loudness Adjustment
- AudioTools Channel Assignment Detection
- AudioTools Channel Manager
- AudioTools SurCode for Dolby E
- AudioTools SurCode for Dolby Digital Plus (with Atmos®)
- AudioTools SurCode for AAC/HE-AAC
- AudioTools SurCode for MPEG Audio
- AudioTools Audio Quality Analysis
- AudioTools Program Correlation Check
- AudioTools Upmix (including Linear Acoustic UPMAX®)
- AudioTools Downmix
- AudioTools Audio Extractor and ReWrap for MXF
- AudioTools Audio Extractor and ReWrap for QuickTime

### Solutions Modules

- AudioTools Advanced Loudness Adaptation
- AudioTools Channel Assignment Detection Automation
- AudioTools Authoring for MPEG-H
- AudioTools Audio Extractor and ReWrap for LXF
- AudioTools Audio Extractor and ReWrap for GXF
- AudioTools Audio Extractor and ReWrap for Transport Streams
- AudioTools Dolby E Wave File Analyzer
- AudioTools Frame Rate Toolbox
- AudioTools Workflow Control
- AudioTools Metadata Verifier
- Omnia.9 for AudioTools Server
- Jünger Audio Level Magic™ for AudioTools Server
- NUGEN Audio DynApt™ for AudioTools Server
- AudioTools Cinavia Verification
- AudioTools AudioSector
- AudioTools Kantar Media / Civolution Watermarking
- AudioTools Quality Control for Dolby E Automation
- AudioTools SilenceTrim Automation

## AudioTools Loudness Measurement

The optional AudioTools Loudness Measurement module provides a comprehensive loudness measurement toolkit supporting current international standards and recommended practices. Furthermore, due to its flexible architecture design, it can easily embrace forthcoming implementations.

The Loudness Measurement module provides the following measurement types:

- Program Loudness
- Dialog Level
- Loudness Range
- Maximum Momentary Loudness
- Maximum Short-Term Loudness
- Loudness Range
- Maximum True Peak Level
- Maximum Sample Peak Level

The Loudness Measurement module provides a reference implementation of the following standards:

- ITU-R BS. 1770-1, 1770-3/4
- ATSC RP A/85
- EBU R 128
- Commercial Advertisement Loudness Mitigation (CALM) Act
- BS.5550-7.4.2
- ARIB TR-B32
- OP-59
- AS-11 UK DPP
- ISO 21727
- Portaria 354

Measurements can be performed independently on any number of programs within a single asset via specifications in the job XML. This means that, in a container file which contains several independent audio programs, each program can be measured and reported independently in one pass. Measurement results can be used by the AudioTools Workflow Control module or third-party applications to not only program loudness adjustment properly, but also conditionally process assets if they are already within specification, or properly categorize assets according to custom loudness specifications.

### Module Output:

- Measurement summary within the job XML returned via web services
- Measurement summary as a CSV file (requires Workflow Control)
- Detailed results log file including continuous measurements and summary

## AudioTools Loudness Adjustment

---

The optional AudioTools Loudness Adjustment module provides a comprehensive loudness adjustment toolkit, which can be customized to supply compliance with any client's audio specification, supporting current and forthcoming international standards and recommended practices, including:

- ATSC RP A/85
- Commercial Advertisement Loudness Mitigation (CALM) Act
- EBU R 128
- BS.5550-7.4.2
- ARIB TR-B32
- OP-59
- AS-11 UK DPP
- ISO 21727
- Portaria 354

Loudness Adjustment and Loudness Measurement modules can be chained together in jobs or workflows to provide any combination of adjustment types. For example, a simple loudness adjustment process consists of loudness measurement, program loudness normalization, true peak limiting, and a final loudness measurement in a single job.

Adjustment can be performed independently on any number of programs within a single asset via program configuration specifications in the job XML. This means that, in a container file which contains several independent audio programs, each program can be adjusted independently in one pass.

Dialog Intelligence™ provides the option to perform loudness adjustments based on the average dialog levels throughout the program, instead of the overall program loudness.

Loudness control is a significant use case and employs Minnetonka Audio's proprietary digital signal processing. While AudioTools loudness normalization profiles are designed to fully preserve the existing audio and only apply a gain change combined with optional peak limiting, there are other use cases that require changing the dynamic range and other more complex parameters of the audio content. Examples include maximum momentary or short-term loudness limiting, loudness range control, or AudioTools Advanced Loudness Adaptation, capable of adaptively conforming a theatrical audio mix for broadcast, as well as creating the best

possible audio experience for modern platforms such as OTT/web, mobile/handheld and VOD/SVOD.

## AudioTools Advanced Loudness Adaptation

---

Advanced Loudness Adaptation is a Solutions Module for AudioTools Server that can adapt content for various platforms and use cases. The available profile templates include Broadcast, Radio, Streaming, News, or Custom Adaptation. Advanced Loudness Adaptation uses an adaptive decision matrix to determine the level and type of processing required. The audio is carefully controlled in a way that preserves the transients, image and artistic intent of the source, while increasing dialog intelligibility when needed. A dynamic and balanced mix can be produced, without resulting in subjectively compressed sound. Audio that is deemed already compliant for the intended use case will pass through the workflow untouched. Requires and uses AudioTools Loudness Measurement (ALMA) and AudioTools Loudness Adjustment (ALAA).

#### AudioTools Advanced Loudness Adaptation features:

- Reduces dynamics and/or Loudness Range.
- Preserves transients & artistic intent of original while preventing subjectively compressed sound quality
- Maintains or improves dialog intelligibility
- Provides a compliant, automated process for all program genres & all target requirements

Advanced Loudness Adaptation is based on Linear Acoustic APTO™, the state-of-the-art algorithm which provides loudness adaptation based on psychoacoustic models that analyze all main aspects involved in human hearing: frequency, intensity, duration, and sound source direction. It extracts the loudness components of the audio asset and intelligently adapts them to produce a comfortable listening experience with consistent average levels. Unlike other solutions, APTO™ architecture relies on sophisticated, optimized processing that is capable of properly defining the ideal amount of required adaptation. This no-compromise approach results in artifact-free audio.

### Omnia.9® for AudioTools Server

---

The AudioTools Omnia.9 module combines the sophisticated audio processing of the Omnia Audio Omnia.9 with the file-based AudioTools eco-system.

This includes Omnia.9 features such as:

- Exclusive “Undo” Technology
- Psychoacoustically Controlled Distortion-Masking Clipper
- Omnia® Toolbox
- Dry Voice Detector
- Auto Pilot
- All other features available in the Omnia.9 processing unit

The AudioTools Server module implementation allows user presets exported from the Omnia.9 real-time audio processor to be integrated into file-based profiles. In addition, over 40 factory presets of the Omnia.9 real-time audio processor are included.

### Jünger Level Magic™ for AudioTools Server

---

The optional AudioTools Jünger Level Magic™ module combines the powerful audio processing of Level Magic with the file-based AudioTools eco-system. Level Magic™ utilizes a proprietary multi-loop approach comprising of three essential elements in parallel to measure, and if necessary correct, out of specification audio. Processing includes an AGC section, a fast-acting transient processor, and a brick-wall filter.

### NUGEN Audio DynApt™ for AudioTools Server

---

The optional AudioTools NUGEN DynApt™ module combines the powerful audio processing of DynApt™ with the file-based AudioTools eco-system. NUGEN Audio’s award-winning technology for loudness-compliant dynamic adaptation allows the reduction of dynamics in the audio while avoiding the introduction of dialog clarity issues common in repurposed content.

## ISOSTEM Upmix for AudioTools Server

---

The optional ISOSTEM Upmix for AudioTools Server module is a software implementation of the ISOSTEM Upmix (Live) device, known for its great sounding upmix. It can be used to upmix stereo material to surround format while ensuring perfect downmix compatibility. The ISOSTEM Upmix algorithm distributes the components of the stereo signal to surround (3.0/3.1/5.0/5.1/7.0/7.1) solely by means of physical properties. The plugin comes with a set of upmix presets that allow a quick start. To adjust and experience the effect of the individual parameters an ISOSTEM Upmix (Expert) device is needed. Together with an Expert device a similar upmix processing for file based and live media can be achieved. Besides only upmixing stereo material, the ISOSTEM Upmix can also downmix, cross mix, encode surround material to LtRt, manage LFE channel and much more.

## ISOSTEM Loudness Ranger for AudioTools Server

---

The optional ISOSTEM Loudness Ranger module achieves a reduction in the Loudness Range (LRA according to ITU BS.1770 and EBU R.128) without producing audible artefacts. The algorithm combines multiple measurement layers from various time windows and applies numerous infinitesimal signal corrections. In this way the LRA can be reduced without affecting the quality of the signal. Furthermore, the method either adjusts the program loudness of the signal to a user-defined value or alternatively preserves the original value. In any case an adjustable maximum true peak level is met.

## AudioTools Audio Extractor for MXF

---

The optional AudioTools MXF Audio Extractor module provides the ability to access the audio and metadata stored in MXF files. Audio tracks within MXF files are extracted efficiently, without unwrapping video tracks. MXF OP1a, OP 1b and OP Atom profiles are currently supported for audio extraction, and more profiles can be added based on project requirements. The MXF Audio Extractor module can optionally store an MXF container map, which can be used for other jobs. This eliminates having to re-parse the file to generate a map each time the file essence needs to be accessed. The module can also extract audio from continually growing MXF files during an ingest operation, for read-only processes such as loudness measurement or audio analysis.

## AudioTools ReWrap™ for MXF

---

The optional AudioTools MXF ReWrap module re-wraps audio data back into existing MXF files. Audio is re-wrapped “in place,” meaning the same audio format is used and samples are simply replaced. MXF OP1a and OP Atom (audio) profiles are currently supported for rewrap, and more profiles can be added based on project requirements.

## AudioTools Audio Extractor for LXF

---

The optional AudioTools LXF Audio Extractor module provides the ability to access the audio and metadata stored in LXF files. Audio tracks within LXF files are extracted efficiently, without unwrapping video tracks.

## AudioTools ReWrap™ for LXF

---

The optional AudioTools LXF ReWrap module outputs audio data into existing LXF files. New audio data replaces existing data. Existing video within the LXF file is not modified.



## AudioTools Audio Extractor for GXF

---

The optional AudioTools GXF Audio Extractor module provides the ability to access the audio and metadata stored in GXF files. Audio tracks within GXF files are extracted efficiently, without unwrapping video tracks.

## AudioTools ReWrap™ for GXF

---

The optional AudioTools GXF ReWrap module outputs audio data into existing GXF files. New audio data replaces existing data. Existing video within the GXF file is not modified.

## AudioTools Audio Extractor for QuickTime™

---

The optional AudioTools Audio Extractor for QuickTime™ module extracts PCM audio streams from QuickTime files of all video formats. The module provides the ability to access the audio and metadata stored in QuickTime files. Audio tracks within QuickTime files are extracted efficiently, without unwrapping video tracks. This module also supports functions for reading QuickTime metadata.

## AudioTools ReWrap™ for QuickTime™

---

The optional AudioTools ReWrap for QuickTime™ re-wraps audio data back into a copy of an existing QuickTime file or audio-only QuickTime files can be created from scratch. Audio can be re-wrapped “in place,” meaning the same audio format is used and samples are simply replaced, or a new Track/Channel configuration can be generated, and the QuickTime file is effectively recreated using the untouched video essence. Channel labeling for track format and language is supported.

## AudioTools Audio Extractor for Transport Streams

---

The optional AudioTools Audio Extractor for Transport Streams module extracts the relevant audio streams from transport streams containing H.264 and MPEG-2 video formats. The module can extract PCM, AC-3, E-AC-3, AAC and MPEG audio types. The module can extract arbitrary numbers of audio streams in an arbitrary number of video programs. Existing video within the transport stream will not be modified. Note that Program Streams are not supported.

## AudioTools ReWrap™ for Transport Streams

---

The optional AudioTools ReWrap for Transport Streams module inserts audio into transport stream files, including H.264 and MPEG-2 video programs. Existing video within the transport stream file will not be modified. The module will only insert the same audio codec type into a stream that previously carried that codec type. Combined use of both the AudioTools Audio Extractor for Transport Streams and the AudioTools ReWrap for Transport Streams modules requires either external automation system or the AudioTools Workflow Control module. Note that Program Streams are not supported.

## AudioTools SurCode for Dolby E Encoder

---

The optional SurCode for Dolby E Encoder module provides comprehensive Dolby E encoding and supports all Dolby E program configurations, parameters, and metadata. Dolby E parameters and metadata can be specified completely via job XML, or the encoder can be instructed to retrieve Dolby E metadata from an upstream Dolby E decoder, if present. Since certain metadata may change between decode and encode operation, some encoding parameters can be overridden to reflect changes during processing: for example when updating Dolby E bit depth, dialog normalization or program description text.

When used in conjunction with SurCode for Dolby E Decoder, AudioTools Workflow Control, and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any Dolby E content. This includes multiple Dolby E streams as well as mixed PCM/Dolby E streams within container formats.

## AudioTools SurCode for Dolby E Decoder

---

The optional SurCode for Dolby E Decoder module decodes Dolby E to PCM program audio, Dolby E metadata, and program metadata. Decoded audio and metadata can be accessed by downstream processors within a job or workflow. This allows the program configuration, for example, to be used to program a downmix operation or split programs to multiple PCM files. The decoder also provides Dolby E detection for determining whether a stream contains Dolby E. This information can be used by Workflow Control or a third-party application for conditionally controlling downstream processing.

When used in conjunction with SurCode for Dolby E Encoder, AudioTools Workflow Control, and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any Dolby E content. This includes multiple Dolby E streams, as well as mixed Dolby E/PCM streams within container formats.

## AudioTools SurCode for Dolby Digital Plus Encoder

---

The optional AudioTools SurCode for Dolby Digital Plus Encoder module provides comprehensive Dolby Digital and Dolby Digital Plus encoding for up to 5.1 streams. It also supports encoding Dolby Digital Plus with Atmos® (Dolby Digital Plus JOC) from multichannel PCM or ADM files. Dolby Digital and Dolby Digital Plus parameters and metadata can be specified completely via job XML, or the encoder can be instructed to retrieve Dolby Digital Plus metadata from an upstream Dolby Digital Plus decoder or Dolby E decoder if present. Since certain metadata may change between decode and encode operation, all encoding parameters can be overridden to reflect changes during processing, including dialog normalization. When used in conjunction with SurCode for Dolby Digital Plus or SurCode for Dolby E Decoder, AudioTools Workflow Control, and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any Dolby Digital or Dolby Digital Plus content.

## AudioTools SurCode for Dolby Digital Plus Decoder

---

The optional AudioTools SurCode for Dolby Digital Plus Decoder module decodes Dolby Digital and Dolby Digital Plus to PCM program audio and program metadata. Decoded audio and metadata can be accessed by downstream processors within a job or workflow. The metadata can be used by Workflow Control or a third-party application for conditionally controlling downstream processing. When used in conjunction with SurCode for Dolby Digital Plus Encoder, AudioTools Workflow Control, and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any Dolby Digital or Dolby Digital Plus content.

## AudioTools MPEG-H Authoring

---

The optional AudioTools MPEG-H Authoring Module provides automated MPEG-H authoring using scene XML templates. The result is a 16 channel WAV output file with MPEG-H metadata control track. As an option, legacy rendered outputs in 2.0, 5.1 and other configurations can be generated. A full MPEG-H authoring workflow including source remapping, loudness control of speech elements, upmix and downmix can be added by way of the AudioTools MPEG-H Authoring Solutions Module (see below).

## AudioTools SurCode for MPEG Audio

---

The optional AudioTools SurCode for MPEG Audio module encodes and decodes MPEG-1 audio layer II (mp2) and MPEG-2 audio layer III (mp3). Decoded audio and metadata can be accessed by downstream processors within a job or workflow. The metadata can be used by AudioTools Workflow Control or a third-party application for conditionally controlling downstream processing. When used in conjunction with AudioTools Workflow Control and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any MPEG audio content.

### Audio Object Types:

LC, LTP, HEAAC, ER\_LC, ER\_LTP, ER\_SCAL, PS, MP2\_LC, MP2\_SBR, SBR\_DS, ER\_SCAL\_SBR, ER\_SCAL\_SBR\_PS, MPS

## AudioTools SurCode for AAC Encoder

---

The optional AudioTools SurCode for AAC Encoder module encodes Advanced Audio Codec (AAC) and AAC variants such as Low Complexity AAC (AAC-LC), Low Delay AAC (AAC-LD), and High Efficiency AAC (HE-AAC), using Fraunhofer's codec implementation. When used in conjunction with AudioTools Workflow Control and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any AAC audio content.

## AudioTools SurCode for AAC Decoder

---

The optional AudioTools SurCode for AAC Decoder decodes Advanced Audio Codec (AAC) and AAC variants such as Low Complexity AAC (AAC-LC), Low Delay AAC (AAC-LD), and High Efficiency AAC (HE-AAC), using Fraunhofer's codec implementation. Decoded audio and metadata can be accessed by downstream processors within a job or workflow. The metadata can be used by AudioTools Workflow Control or a third-party application for conditionally controlling downstream processing. When used in conjunction with AudioTools Workflow Control and other processing and analysis modules, AudioTools Server provides a comprehensive, automated system for processing of any AAC audio content.

## AudioTools Dolby E WavFileAnalyzer

---

The optional AudioTools Dolby E WavFileAnalyzer module performs QC analysis and correction of Dolby E files. The results of the processing are formatted as an XML element within the job file, which can be retrieved from the system. Those results include a summary section as well as details classified as errors, warnings and information.

The module may be optionally configured to correct Dolby E guard band and preamble alignment throughout the Dolby E stream as specified by SMPTE 337M. Source files for non-SMPTE 337M analyses can also be linear PCM, in either WAV or Broadcast WAV format, without Dolby E essence. You may specify analyze or align. If you are analyzing, no output file is generated. If you specify alignment, the source asset is analyzed and aligned, and a new output file is generated.

#### QC & Correction Functions:

- Chunk analysis for BWF & RF64 files (file size, sample rate, word length, and track type)
- SMPTE 337M analysis includes bit depth, metadata key, program configuration, frame rate, video format, word spacing, number of SMPTE 337M words found, error listing, number of errors, warnings
- Peak detection
- Preamble spacing includes video alignment, alignment correction, and file duration

## AudioTools Metadata Verifier

---

The optional AudioTools Metadata Verifier module decodes and checks the consistency of Dolby E metadata.

- Decoding of metadata is performed for each frame of the Dolby E stream and for each program within the stream.
- Metadata is checked for consistency across all frames.
- The results of the processing are formatted as an XML element within the job file. The results include the Dolby E metadata and program metadata of the first frame of the stream and identify any changes to the metadata that occur in subsequent frames of the stream.
- Results describe which metadata element has changed and the value before and after the change.
- A metadata verifier log file can be specified which would contain the complete set of Dolby E metadata for every metadata change within the file.

## AudioTools Upmix

---

The optional AudioTools Upmix is useful for converting any mono or stereo content to surround format, particularly back catalog films, television shows, documentaries, deleted scenes, and featurettes. The module is designed to typically position dialog in the center channel and to ensure that all resulting material is fold down-compatible, essential to preserving the intent and quality of the original stereo mix. The module includes ready-to-use settings templates for broadcast and allows access to process parameters for individual configurations. Also supports creating a stereo signal from mono content for a subsequent stereo to 5.1 upmix. Supports surround formats up to 7.1, and immersive configurations up to 9.1.6, to address the requirements for NextGen TV.

## AudioTools Downmix

---

The optional AudioTools Downmix module accepts up to 7.1 multi-channel PCM audio and performs a downmix to a stereo or mono program.

- Accepts up to 7.1 and provides control over input trims and the use of an optional limiter
- The Downmix module accepts parameters that specify the center and surround downmix levels, and selection of Lo/Ro or Lt/Rt downmix coefficients.
- The Downmix module can be controlled by Dolby E metadata derived from the AudioTools SurCode for Dolby E Decoder module.
- The Downmix module includes a Low Pass Filter (LPF), with user adjustable frequency and gain. The LPF can be disabled.
- The Downmix module takes 6 channels as input and produces either 2 channels out or 8 channels out, with the original 5.1 + downmixed channels on 7 & 8.
- The Downmix module also includes SurCode for Dolby Pro Logic II encode.

## AudioTools AutoMix

---

The optional AudioTools AutoMix module provides an auto-mixing and auto-ducking toolset for AudioTools Server. When adding a dialog track or an audio description track to an existing mono, stereo, or 5.1 bed audio track, audio levels will be adjusted in an automated way, based on a number of controllable parameters, to produce a consistent output mix without operator involvement.

## AudioTools Channel Manager

---

The optional AudioTools Channel Manager module provides altering, swapping and replacing of audio programs or audio channels in MXF, QuickTime, Dolby E or multi-channel PCM files. Note that AudioTools Extractor/ReWrap for MXF, AudioTools Extractor/ReWrap for QuickTime or SurCode for Dolby E Encoder/ Decoder are required for processing MXF, QuickTime or Dolby E content.

The Channel Manager swap function can swap and re-order any audio channel or audio program configuration within MXF or QuickTime container formats, and in Dolby E or multi-channel PCM audio files.

The Channel Manager mute function can be used to mute selected audio channels.

The Channel Manager channel replace function supports replacing one or more existing audio channels with an external audio file. This can be used to replace language tracks in existing video or Dolby E containers.

The Channel Manager supports adding audio tracks to MXF or QuickTime containers, as well as removing audio tracks. The Channel Manager license also includes access to using the Omneon Media API on AudioTools Server.

## AudioTools Audio Quality Analysis

---

The optional AudioTools Quality Analysis module uses a flexible algorithm to analyze incoming PCM audio content and detect anomalies such as data corruption and program gaps/silence. Given a specified energy threshold in a specified frequency range the module reports the results for a given period of time. Using these parameters, the module can be configured to detect a wide variety of anomalies.

This module generates an output log that indicates the occurrences of anomalies found and the timecode locations where they occurred. For each analysis or reporting period a value in dB is returned every time the threshold is exceeded. As this is purely numeric data the AudioTools Workflow Control option is highly recommended so that subsequent processes and modules can take advantage of the data produced and act on those results.

AudioTools Quality Analysis can report silence gaps, dropouts, and phase correlation errors, amongst others.

## AudioTools Channel Assignment Detection

---

The optional AudioTools Channel Assignment Detection module determines channel locations within multi-channel programs. Based on relative loudness levels, channel correlation and frequency range, the module identifies likely channel pairs, front/rear channels, center and LFE. It is recommended to use the AudioTools Channel Assignment Detection module in combination with the AudioTools Channel Assignment Detection Automation Solutions Module, a solutions profile for AudioTools Workflow Control to automatically match results from the detection module against a large number of potentially expected channel layouts.

## AudioTools Program Correlation Check

---

The optional AudioTools Program Correlation Check module performs a correlation check between two audio programs, either within a single file or in separate files, and is used to determine whether both represent the same content. The number of channels in each program may range from 1 to 8. A common workflow uses the Program Correlation Check module to evaluate eight channel, 5.1 + 2.0 PCM audio decoded from the SurCode for Dolby E Decoder module to correlate the 5.1 and stereo programs and determine if the stereo program is derived from the surround program.

The log output of the module indicates the level of correlation found during the program comparison, with minimum, maximum and average correlation values, correlation values per analysis interval, and the initial alignment time. Based on those results, potential problems can be flagged, for example if the programs are entirely different, or only in certain regions. The initial alignment time can indicate sync issues between the two programs.

It is recommended to use AudioTools Program Correlation Check in combination with AudioTools Workflow Control or an external workflow automation tool to automatically analyze measurement results.

## AudioTools Frame Rate Toolbox

---

The AudioTools Frame Rate Toolbox option is a signal processing module that provides multichannel, phase-coherent pitch shift, time stretch and sample rate conversion for frame rate and format adjustment and correction. This module is useful for standards conversion workflows, duration modification and other audio time-base and time-domain correction tasks.

## AudioTools AudioSector

---

The optional AudioTools AudioSector module provides time/segment-based insertion, deletion and/or muting. Predefined region definitions are driven via workflow XML and could be static or resulting from the AudioTools Quality Analysis module, defining regions based on frequency and/or amplitude. Detected regions can be removed or muted. Audio segments can also be inserted at the start or end of a detected region. That way, in conjunction with Workflow Control and AudioTools Quality Analysis, AudioSector can allow for an automated editing tool. It is recommended to use AudioTools AudioSector in combination with the AudioTools SilenceTrim Automation Solutions Module (ASTS).

## AudioTools Cinavia Verification

---

The optional AudioTools Cinavia Verification module performs certified Cinavia watermark verification that detects and reports the presence and/or absence of Cinavia watermark payloads in audio essence processed through AudioTools Server. The module, which can be invoked from within AudioTools Server jobs or workflows, provides a summary of all valid Cinavia payloads, plus a detailed report in XML format. The module supports sample rates from 44.1 to 192 kHz in up to 16 channels of LPCM, AC-3 or E-AC-3 essence. This enables simple handling of multiple downstream watermarking requirements in a completely automated environment.

## AudioTools Kantar Media / Civolution Watermarking

---

The optional AudioTools Watermarking module adds Kantar Media / Civolution NexTracker Audience Measurement watermarking for audio essence and/or integration with Kantar Media / Civolution's SyncNow Automatic Content Recognition service that is being used in Secondary Screen ecosystems. SyncNow enables server-side content identification and triggering for real-time recognition of broadcast content. AudioTools Server provides secure integration with SyncNow for watermark detection and validation.

The Kantar Media / Civolution Watermarking module works within the AudioTools Server environment to seamlessly watermark content within larger workflows involving many AudioTools Server processes, or as a standalone watermarking solution. The Kantar Media / Civolution Watermarking module for AudioTools Server can be applied at any point in the AudioTools Server workflow, the most common point being post-processing as the audio is re-wrapped to the final container.

## AudioTools Server Solutions Modules

---

AudioTools Solution Modules provide powerful and ready-to-use workflow profiles for AudioTools Server. Solutions Modules are encapsulated workflows for a specific use case. AudioTools Solution Module requires AudioTools Server, AudioTools Workflow Control, and the specific functionality modules for that solution.

## AudioTools Advanced Loudness Adaptation

---

Advanced Loudness Adaptation is a Solutions Module for AudioTools Server that can adapt content for various platforms and use cases. The available profile templates include Broadcast, Radio, Streaming, News, or Custom Adaptation. Advanced Loudness Adaptation uses an adaptive decision matrix to determine the level and type of processing required. The audio is carefully controlled in a way that preserves the transients, image and artistic intent of the source, while increasing dialog intelligibility when needed. A dynamic and balanced mix can be produced, without resulting in subjectively compressed sound. Audio that is deemed already compliant for the intended use case will pass through the workflow untouched. Requires and uses AudioTools Loudness Measurement (ALMA) and AudioTools Loudness Adjustment (ALAA).

### AudioTools Advanced Loudness Adaptation features:

- Reduces dynamics and/or loudness range.
- Preserves transients & artistic intent of original while preventing subjectively compressed sound quality
- Maintains or improves dialog intelligibility
- Provides a compliant, automated process for all program genres & all target requirements

Advanced Loudness Adaptation is based on Linear Acoustic APTO™, the state-of-the-art algorithm which provides loudness adaptation based on psychoacoustic models that analyze all main aspects involved in human hearing: frequency, intensity, duration, and sound source direction. It extracts the loudness components of the audio asset and intelligently adapts them to produce a comfortable listening experience with consistent average levels. Unlike other solutions, APTO™ architecture relies on sophisticated, optimized processing that, is capable of properly defining the ideal amount of required adaptation. This no-compromise approach results in artifact-free audio.

## AudioTools Channel Assignment Detection Automation

---

The AudioTools Channel Assignment Detection Solutions Module determines the channel locations within a multi-channel program based on the audio essence.

Usually tailored to unique customer requirements, the logic will first determine the overall number of audio channels, and then try to map the existing audio channels to any given number or combination of audio programs, including mono, stereo, 5.1, 7.1 (SMPTE, AES) or Dolby E.

AudioTools workflow logic can drive resulting actions based on the determined channel assignment, such as automated conforming into a desired house format, creation of missing programs by upmixing or downmixing existing programs. Alternatively, the result of the detection process can just be passed to the overall workflow automation and trigger next actions there.

Requires AudioTools Server and AudioTools Workflow Control. Requires AudioTools Channel Assignment Detection (AQEA) and optional AudioTools Extractor modules for MXF, QuickTime or other container formats.

## AudioTools Authoring for MPEG-H

---

The AudioTools Authoring for MPEG-H Solutions Module provides a comprehensive toolset for automated, file-based pre-processing of content prior to MPEG-H encoding in the transmission chain. Starting with identifying and mapping audio elements of the source file with the components in the target MPEG-H scene (bed tracks, speech elements, objects), the workflow will automatically remap those elements if required, with optional upmix and downmix. Loudness control of individual speech elements of the MPEG-H presentation is performed prior to automated authoring using MPEG-H scene XML templates. The result is a 16 channel WAV output file with MPEG-H metadata control track. As an option, legacy rendered outputs in 2.0, 5.1 and other configurations can be generated, with Advanced Loudness Adaptation processing if desired. Requires AudioTools Loudness Measurement and Loudness Adjustment. Optional modules include the Advanced Loudness Adaptation Solutions Module, Audio Tools Upmix, AudioTools Downmix, and Extract modules for video containers (MXF, QuickTime etc.).

## AudioTools Quality Control for Dolby E Automation

---

The AudioTools Quality Control for Dolby E Solutions Module leverages the combined power of SurCode for Dolby E, the WaveFile Analyzer Module and AudioTools Metadata Verifier. Includes chunk analysis for BWF and RF64 files, SMPTE 337M analysis, correction for SMPTE alignment, metadata consistency check and more. Requires one or multiple of the following modules: AudioTools Dolby E WavFileAnalyzer (WFAA), AudioTools Metadata Verifier (MDVA), AudioTools SurCode for Dolby E Decoder (SEDA), and AudioTools Loudness Measurement (ALMA).

## AudioTools SilenceTrim Automation

---

The AudioTools SilenceTrim Solutions Module fully automates silence detection and segment processing to remove or add analog and/or digital silence sections. It is particularly suited to automatically trim content for radio broadcasts, using AudioTools AudioSector and AudioTools Quality Analysis silence detection to detect start and end of audio programs and removes silence from head and tail of the audio file. Requires AudioTools Quality Analyses (AQAA) and AudioTools AudioSector (AASA).



## Customer–Defined & 3rd Party Modules

---

AudioTools Server has been designed to also host customer–defined modules. Other manufacturers are welcome to use the AudioTools Server platform as a vehicle for making their specific functionality available in an enterprise level, file–based environment.



1241 Superior Ave. • Cleveland, Ohio, 44114, USA • +1.216.241.7225 • [TelosAlliance.com](http://TelosAlliance.com)