Vcodes

Automated Content Preparation System

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Description

Automation

Vcodes is a software based platform for creating and managing automated workflows for video content preparation. The Vcodes concept eliminates the need for expensive manual processes and expert knowledge needed in preparing and repurposing content for broadcasters, OTT applications and large video archives.

The heart of the Vcodes platform is a Vcodes developed software, which intelligently manages the transformation of any video source to any format.
Once a workflow has been designed by the Vcodes experts (or by the customer), the entire process is automated:

1. Source ingest from tapes, optic media, media files or NLEs
2. Complex source analysis, error detection and metadata retrieval
3. Video and audio advanced pre-processing
4. Video and audio transcoding
5. Multiple audio track dubbing
6. Subtitles insertion
7. Logo, watermarking graphics and ad insertion
8. Content verification
9. Secure network delivery

Integration

The Vcodes concept is unique: an intelligent engine that integrates and controls all of the video/audio processes required, via licensed 3rd party tools, both software and hardware. Those tools are carefully selected and go through extensive testing by the Vcodes engineers, for quality and compliance. This approach provides Vcodes the advantage to deliver the highest quality results while conforming to the strictest industry standards.

On top of the already proven tools that Vcodes is integrated with, the modular approach allows for future integration with newly required 3rd party tools, to enable quick adaptation to changing scenarios.

Vcodes is open for external integration to content management systems (CMS/MAM), video servers and other specific environment needs. This allows Vcodes to either serve as a stand-alone unit, or become a completely integrated part of a CMS (Content Management System). Vcodes has already integrated with several well-known broadcast and OTT CMSs like Dalet, Alcatel-Lucent MCM and Tvinci.

Vcodes CPS Ltd, 34b Habarzel Street, Ramat Hachayal, Tel Aviv 69710, Israel

www.vcodes.tv

Customization

The Vcodes modular architecture allows for full customization of specific required workflows, by quickly adding or replacing required modules.

In the first steps of building a video preparation workflow, the Vcodes expert team of engineers offers the customer a complete professional services package.
Our engineers study the specific content preparation environment including STBs and VoD servers, then build, test and fine-tune the required Vcodes workflows while ensuring maximum quality and conformance with end devices.

A software based solution means quick and flexible customization and protecting your investment. The Vcodes system is future-proof and will grow with your needs. The software's server-client architecture provides multi CPU support and network processing for high volume throughputs.
Customization doesn't end at the Vcodes software. Vcodes can provide a complete turn-key solution, starting from a single workstation to a fully redundant Telco-grade system.

Architecture

The Vcodes software architecture operates in Windows .NET environment and is built out of the following modules:

Server

The Vcodes Server is the engine which controls, manages and coordinates the different Vcodes modules. The Server reads and writes to an SQL database to manage complex, high volume workflows.

Tape Capture

The Tape Capture module is in charge of controlling Betacam/HDCAM/DVCAM tape decks via RS-422 serial connection and supports frame accurate VITC timecode.
The module is fully integrated with the Blackmagic Decklink cards (models depending on requirements) to ensure high-quality 10-bit uncompressed video, via SDI or HD-SDI connections. Also available is support for analog Component connections and AES for audio.

The Tape Capture module receives a new capture job from the Vcodes Server and asks the user to insert a required tape to the tape deck. The tape will then be captured according to the job specified Timecode In and Timecode Out values, and perform real-time encoding to broadcast industry standard formats like XDCAM, DVCPRO, AVC-Intra and MJPEG2000.
These captured master files can be automatically transcoded to further mezzanine or broadcast formats, according to the predefined workflows in the Vcodes system.

Depending on system configuration, multiple capture and encoding tasks can be ran simultaneously, thus maximizing resource allocation efficiency. No matter the configuration, the Tape Capture module always receives highest resource priorities to ensure no dropped frames.

Same-tape jobs are auto detected and timecode sorted, to ensure the most optimized capture workflow.

Live to VoD – *Work in progress*

The module will enable scheduling and capturing of Live TV programs received from multicast streams via Ethernet. The Live TV programs will be processed by Vcodes and delivered as VoD titles to the customer's service platforms.

Subtitles

Vcodes supports 3 modes of subtitles insertion: Overlaid, DVB subtitles and TTML subtitles.

Overlaid subtitles (also referred to as Open Subtitles or Burnt-in Subtitles) are superimposed and encoded with the video. The advantage: subtitles can be added to any video format. Cons: the process is irreversible and no support for multiple subtitle tracks.

With DVB subtitles, the subtitles are inserted as subtitle tracks, completely separate from the video data. This means that subtitles can be switched on and off by the end user and multiple subtitle tracks are supported. Cons: DVB subtitles are supported only in MPEG Transport Streams. DVB subtitling also requires support within the STB in IPTV and Cable environments.

TTML subtitles are becoming the new standard for streaming internet videos, like IIS Smooth Streaming. The major advantage here is that, similar to DVB subtitles, one video can include multiple language subtitles.

Vcodes uses its Watch Folder module to receive subtitle files (STL, PAC, 890 and more) and automatically assign them (via naming conventions) for processing with the relevant video. The subtitle module verifies that timecodes written in the subtitle files are in sync with the video timecode.

User has full control over timecode synchronization, languages and appearance.
Vcodes can also generate low resolution proxy videos, with timecode printed, to be used by external subtitling studios for reference.

Multiple audio tracks support

The multiple audio tracks engine provides complete control over audio channel mapping, including multi-channel scenarios like Dolby E pass-through and encoding to Dolby Digital.

Video/Audio Processing

Vcodes uses an intelligent video/audio processing engine to cover all needs: from simple video crop and scale operations to advanced motion compensated noise removal and standards conversion (see complete table below).
The module deploys an accurate interlacement analysis algorithm and automatically applies predefined operations for deinterlacing.

SD/HD Encoder

The Vcodes Encoder module controls the most efficient 3rd party video and audio software encoders. Depending on format and customer requirements, Vcodes integrates with leading market encoders like Mainconcept and the well renowned open-source x264.

The Encoder module receives the encoding job from the Vcodes Server along with the encoding parameters specified in the predefined encoding profile. It will then allocate the encoding job to an available CPU within the Vcodes network. Upon completion, the encoded elementary streams are delivered to the multiplexer for wrapping in the correct container format.
Vcodes supports encoding to H.264, MPEG-2, VC-1 and more (see complete table below).

Multiplexer

The Vcodes Multiplexer module wraps the elementary streams received by the encoder modules, into the predefined container format. The more advanced container formats supports adding also multiple audio tracks, multiple subtitle tracks and metadata.
The Transport Stream multiplexer uses the industry's most advanced software (by Manzanita Systems) to ensure full compliancy to CableLabs standards and robust error detection mechanism.

Automatic re-wrapping

Drastically cut down on encoding time! The Vcodes multiplexer automatically detects source and destination video types are the same and performs rewrap only, with no re-encoding.

Trimming

Vcodes enables frame accurate video/audio trimming, regardless of GOP sizes, for single job or batch processing.

Watch Folder

For a completely automatic operation, the Watch Folder module enables Vcodes to monitor a specified directory on the local drive or the network (UNC). Once a media file is dropped into this folder, it will immediately enter the Vcodes predefined workflow.

Distribution

The distribution module ensures the prepared file is transferred completely to its final destination, whether to a local drive, a network UNC location, or a secured FTP.

Control, Reports & Statistics

The administrator GUI offers full monitoring and control over all running jobs and supports generating reports and statistics to get the big picture on your encoding farm.

Review

The Vcodes Review module enables the operator to perform traditional QC by watching and listening to the final prepared file, checking the media technical information, verifying audio sync and timecode, and finally approving or denying the content.

Priorities and Resources Allocation

Via the Administrator panel, the operator has complete control over resource allocation. Certain machines can be allocated to specific projects, in order to better distribute resources in the network according to priorities.

Furthermore, project and job priorities can either be predefined in the workflow, or detected automatically according to deadlines set in metadata XMLs.

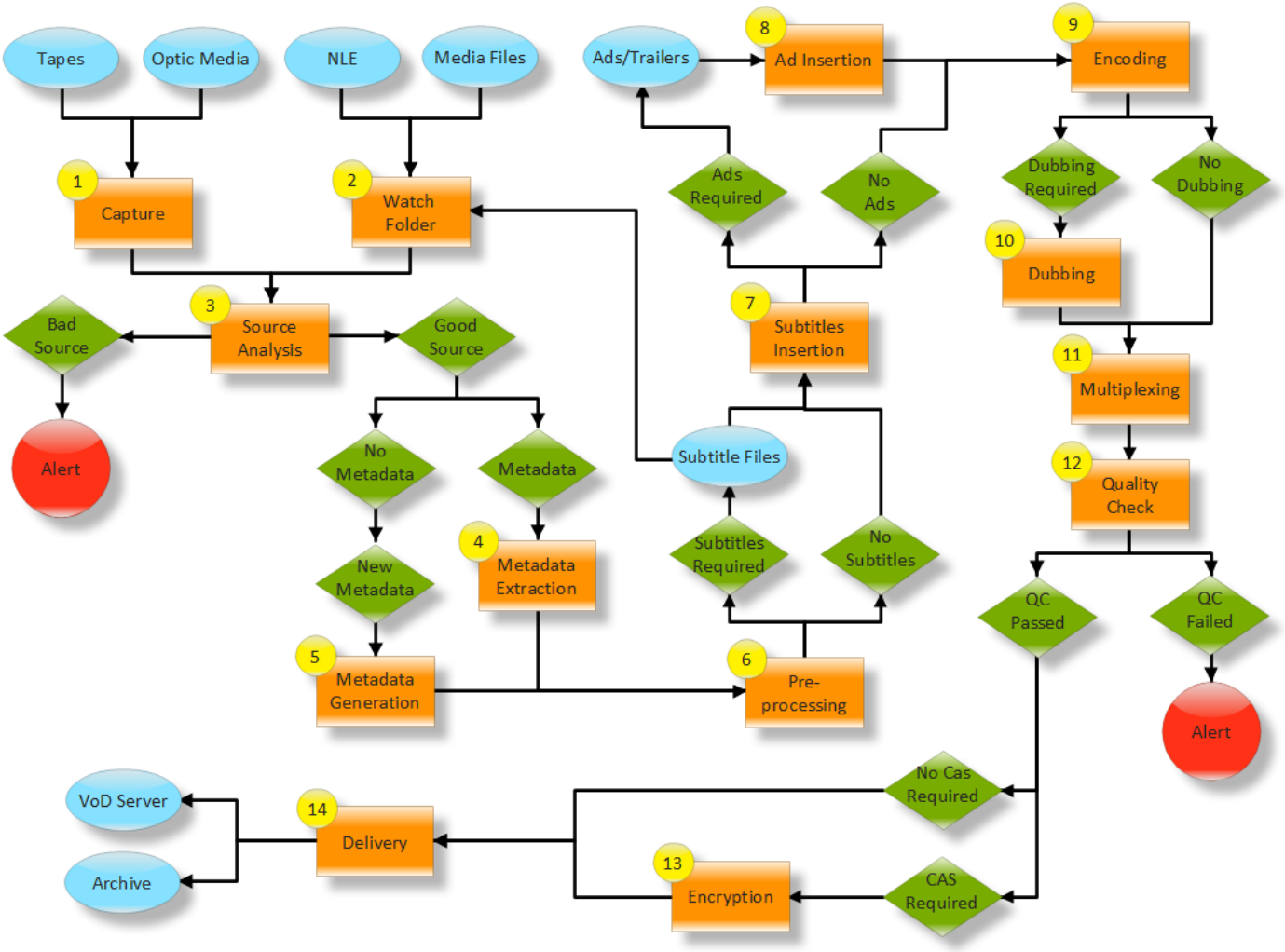

Figure 1: The Vcodes automated workflow

Automation Points Explained

1. Capture from tapes and optic media would require the user to simply insert the media that Vcodes requests. The capture points would be predefined in an Excel/XML job list, or in the case of a single job - within the Vcodes Control Panel.
2. Media files have to be copied to the “Watch Folder” which automatically triggers the rest of the process.
3. Vcodes performs an automated source analysis, to verify whether the source files are compliant for the given workflow. A source which is found to be incompliant will trigger an alert and will not be processed.
4. Vcodes will automatically extract the source technical and descriptive metadata and add it to the project database. When integrated with content management systems, the metadata would automatically be transferred to the CMS in its required format if required.
5. Vcodes ensures imported metadata is compliant to the required workflow and if it isn’t, it will be converted to the correct format. If a source does not have any metadata associated with it, Vcodes will trigger the operator to generate new metadata using the Vcodes metadata generator. The same

generator can also be used to manually edit and correct existing metadata. Pre-processing options defined in the workflow are assigned to the video and audio, from basic operations such as scaling, cropping, deinterlacing to complex high quality processing such as graphics/logos overlay, noise removal, spots/scratches cleanup and image stabilization.

6. Subtitles will be inserted into the video, if required in the workflow definitions. Vcodes will look for subtitle files in its Watch Folder, check them for compliancy and add them to the video according to their timecode information.
7. Timecodes can be predefined in the Vcodes job list, in order to insert predefined ad videos.
8. Vcodes engineers constantly ensure that encoding in Vcodes provides the highest quality possible while maintaining compliancy to the industry standards. Large volume encoding is processed efficiently on multiple CPUs using Vcodes infinitely scalable server/client architecture.
9. If required by the workflow rules, Vcodes will insert multiple external audio tracks and to be dubbed with the video.
10. Multiplexing is a critical step, especially for the Cable/IPTV industries. Vcodes uses the best tools, selected, configured and maintained by the Vcodes engineers to ensure complete compliancy to industry standards and features.
11. Quality check in Vcodes has 2 optional levels: basic and advanced. The basic QC verifies the completed file for full technical compliancy in the broadcast environment and lets the operator perform an audio/visual review to spot for any issues. The advanced QC automatically scans the entire video and audio for quality issues like blocking artifacts, frozen frames, black frames, audio levels and more.
12. If content protection is required as part of the automated workflow, Vcodes integrates with the required DRM/CAS vendor to encrypt the prepared content, according the predefined specifications.
13. At the end of a successful process, the content will be securely delivered by Vcodes to its final destination, whether it is a local archive storage or a remote FTP for automated ingest by the VOD server.

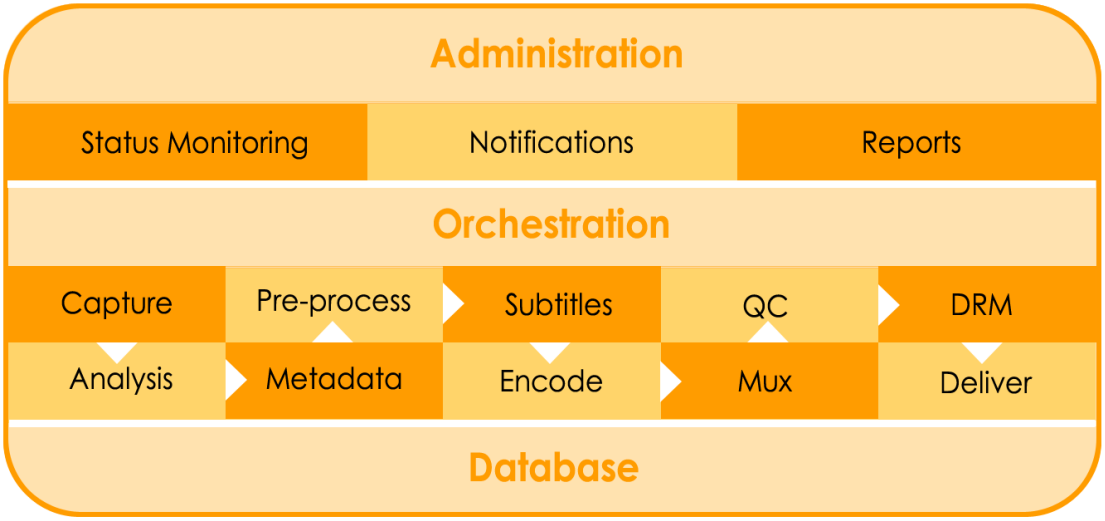

Figure 2: The Vcodes architecture

Specifications and System Requirements

Supported video and audio formats:

Container	CODEC
DVD optic media	MPEG-2
Blu-ray optic media	MPEG-2, H.264, VC-1
AVI	Cinepak, Video-1, Indeo, IYUV, DivX, Xvid, DV, HDV, Uncompressed
MPEG-1	MPEG-1
MPEG-2 Program Stream / VOB	MPEG-2
MPEG-2 Transport Stream	MPEG-2, H.264, HDV, AVCHD
MP4 (MPEG-4)	MPEG-4, H.264
3GPP	MPEG-4, H.263, H.264
FLV	Sorenson, On2, H.263, H.264
Windows Media	VC-1 Simple/Main/Advanced
ASF (legacy)	WMV7, WMV8, WMV9
Quicktime MOV	All QT 7 codecs
MXF	MJPEG2000, MPEG-2, D10(IMX), XDCAM, DVCPRO, DVCPRO HD, DV
Omneon (QT REF/Embedded)	MPEG-2, D10(IMX), XDCAM, XDCAM HD 422, DVCPRO, DVCPRO50, DVCPRO HD, ProRes
HLS	H.264
IIS SmoothStreaming	H.264, VC-1
MPEG DASH	H.264
Audio Formats	PCM, MP2, MP3, AAC, AC3, DTS

Video Processing

Crop & Resize
Blur & Sharpen
Motion Compensated Deinterlacing
Inverse Telecine/3:2 Pulldown
Color Correction (proc amp)
Superimpose logos and graphics (watermarking)
PAL/NTSC motion compensated conversion
Frame rate conversion
Noise removal
Grain removal
Scratches/Spots removal
Image stabilization

Audio Processing

Audio levels
Audio normalization
Dynamic Range Compression
AC3 Delay correction

Data

Excel job lists
XML job lists
XML metadata
Cavena .890 subtitles
Spruce STL subtitles
Screen PAC subtitles
SRT subtitles

Minimum System Requirements*

Intel or AMD based configuration
Quad Core CPU at 2.4 Ghz or better
Windows 2008 Server or Windows 7 SP1
4GB RAM or more
120GB internal storage or more

**The size of the hardware configuration is dependent on the customer's requirements and scale of the deployment.*

For Tape Capture**

Blackmagic Decklink
Nvidia Geforce or Quadro display card
Dedicated storage

***Exact models and capacities depend on Vcodes configuration.*

GUI Screenshots

Figure 1: The Vcodes Administrator: Running jobs

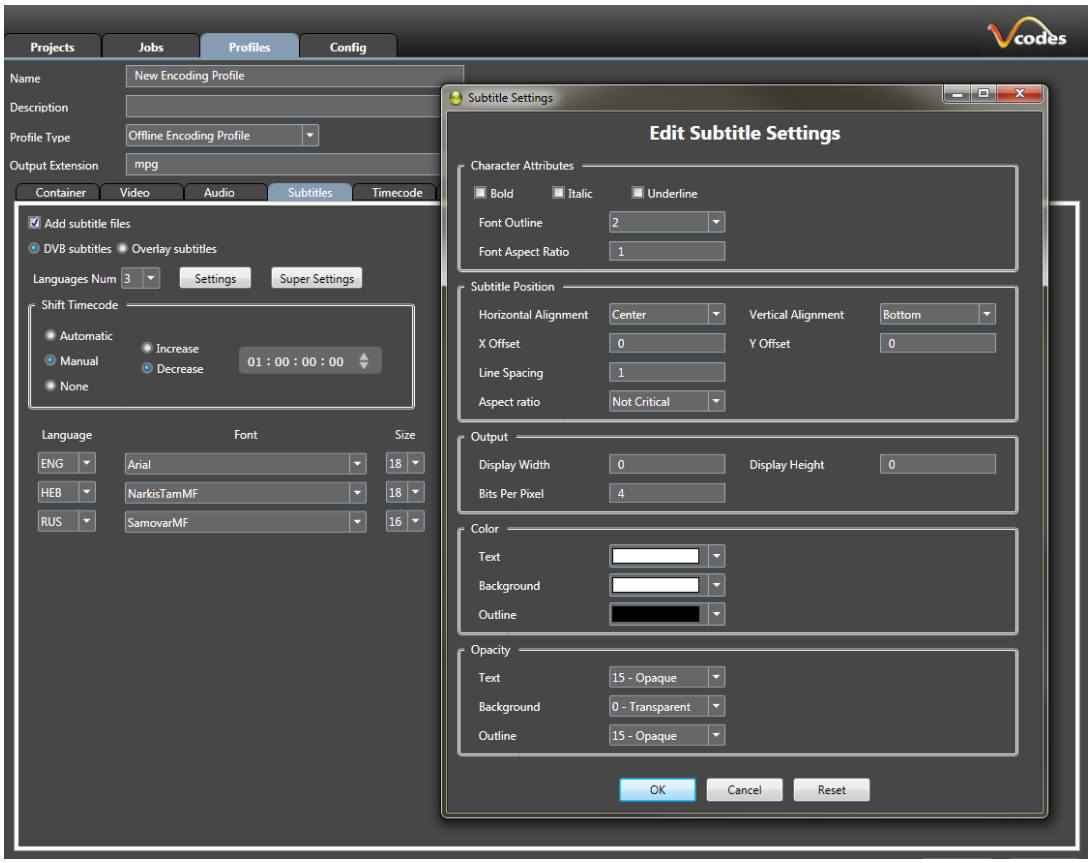

Figure 2: The Vcodes Administrator: Profile design – subtitles controls

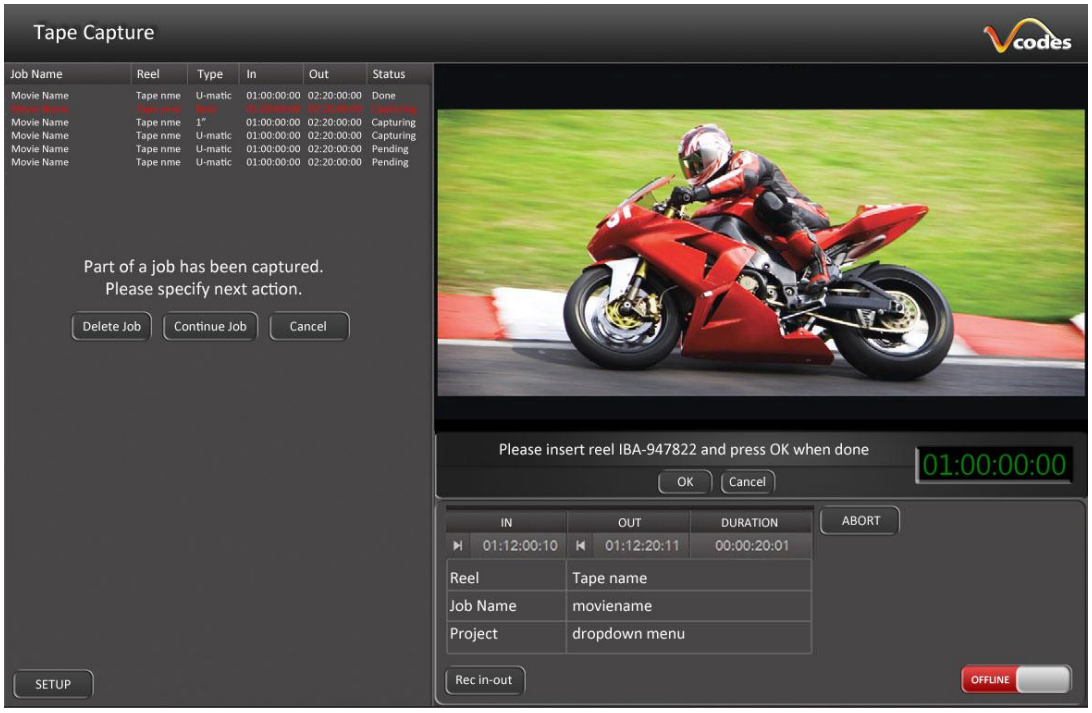

Figure 3: The Tape Capture module