sachsMEDIA

A Scalable Open Source Framework for Live Media Production and Distribution

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Based upon the open source multimedia framework Videolan Client (VLC) we developed a scalable solution for video live production. It allows recording, composing images, encoding and distributing to digital TV, web or smartphones. With the help of few simple and low budget components as a laptop, (H)DV camera and VGA grabber both video and audio as well as the current picture of a beamer can be captured and arranged at high quality. Graphical elements as logo, lower thirds and program infocards can be superimposed and managed. All components are connected via IP and can be distributed across several PCs and servers in accordance with the requirements. A playout system capable of both broadcast and broadband transmission can be established either on the on-site laptop or on more powerful remote servers.

Proving the system in practice

With our system we successfully realized the transmission of several lectures and large-scale events such as the *Chemnitzer Linux-Tage* 2010 and 2011.

The talks of up to 5 parallel tracks were captured, mixed and transmitted <u>live</u> via DVB-T and Internet streaming.

For that purpose, we used a distributed setup realizing source aggregation and video mixing using laptops on-site on the one hand and transcoding to the target formats using powerful remote servers on the other hand.
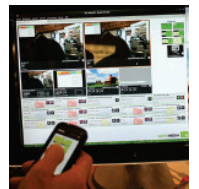

Source aggregation and video mixing during a showcase at Chemnitzer Linux-Tage 2011.

Control + Monitor interface with the web browser

- configurable previews:
  sources – video mix – resulting streams
- preset buttons for a quick toggle of shot compositions
- surveillance and control:
  encoders – recorders – outgoing streams
- scalability: one front-end controls several back-ends
- location-independance to control operations from almost anywhere
- GUI elements are quickly configurable
- quick GUI adaption for different purposes, e.g. local video mixing with limited stream administration or centralized playout control without video mixing

Web front-end and mobile front-end for video mixing control.

Control + Monitor Interface

Video Mixers: Previews | Sources start/stop | Layering | Image Scaling | Image Composition | Encoders start/stop | Recorders start/stop | Streamers start/stop

Playouts: Supplem. Playouts start/stop | Program Infocards | Stream Switch

multiple control interfaces

The Framework

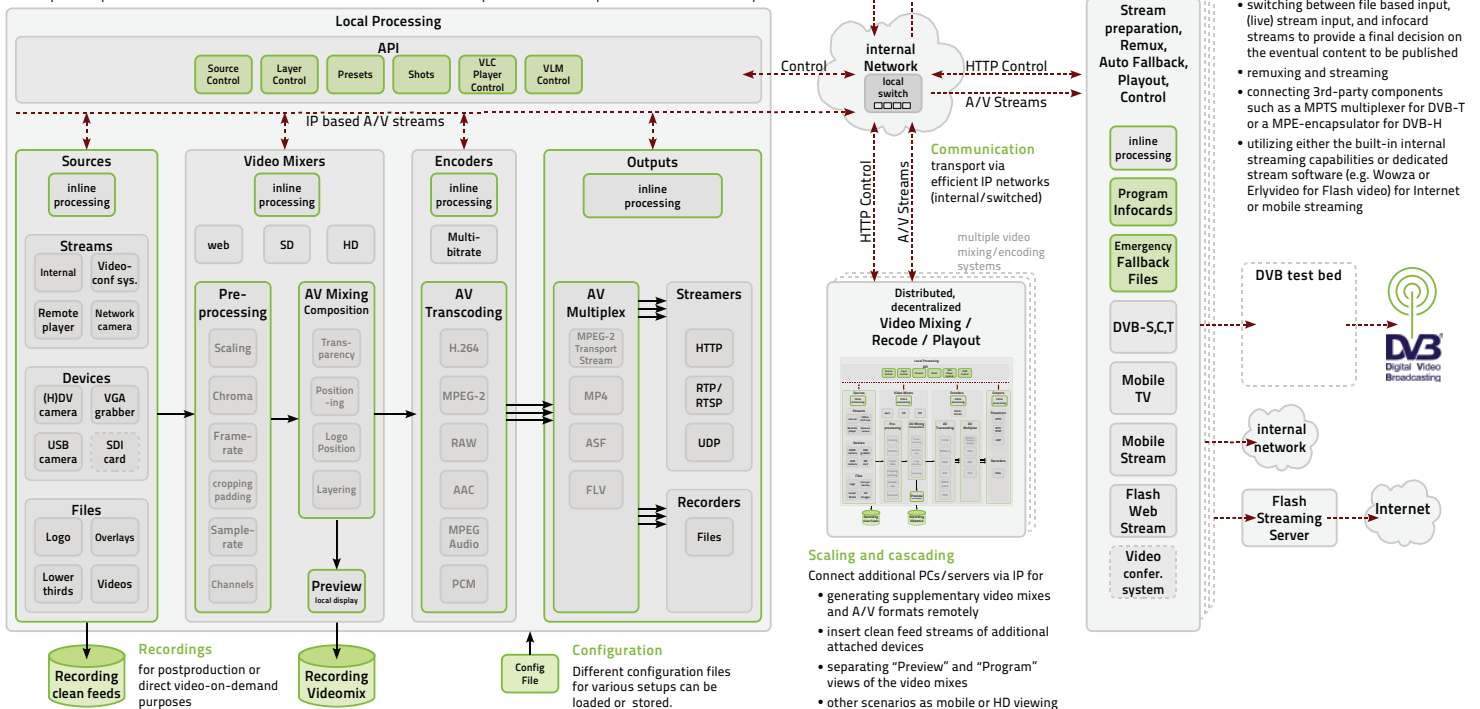VLC as base framework offers a flexible A/V processing chain for:
- Source aggregation
- AV processing
- Composition
- Encoding
- Multiplexing
- Output provision

Those consecutive components can be connected via IP. An API enables their independent control.

The resulting IP streams might carry compressed or even raw A/V content. In summary, multiple parallel sources, encoders, and outputs are possible.

Access to objects and functions: The API

- built-in HTTP interface enables network control
- internal Lua scripting engine provides a server pages approach for the easy adding of functionality
- resources can be managed and monitored via HTTP requests and JSON responses in a service-like way

Local Processing

API: Source Control | Layer Control | Presets | Shots | VLC Player Control | VLM Control

IP based A/V streams

Sources — inline processing
- Streams: Internal | Video-conf sys. | Remote player | Network camera
- Devices: (H)DV camera | VGA grabber | USB camera | SDI card
- Files: Logo | Overlays | Lower thirds | Videos

Video Mixers — inline processing — web | SD | HD
- Pre-processing: Scaling | Chroma | Frame-rate | cropping padding | Sample-rate | Channels
- AV Mixing Composition: Transparency | Positioning | Logo Position | Layering
- Preview local display

Encoders — inline processing — Multi-bitrate
- AV Transcoding: H.264 | MPEG-2 | RAW | AAC | MPEG Audio | PCM

Outputs — inline processing
- AV Multiplex: MPEG-2 Transport Stream | MP4 | ASF | FLV
- Streamers: HTTP | RTP/RTSP | UDP
- Recorders: Files

Recordings
for postproduction or direct video-on-demand purposes

Recording clean feeds

Recording Videomix

Configuration
Different configuration files for various setups can be loaded or stored.

Config File

Communication
transport via efficient IP networks (internal/switched)

internal Network — local switch

HTTP Control — A/V Preview Streams — A/V Streams

Logging Events

Distributed, decentralized Video Mixing / Recode / Playout

multiple video mixing/encoding systems

Scaling and cascading
Connect additional PCs/servers via IP for
- generating supplementary video mixes and A/V formats remotely
- insert clean feed streams of additional attached devices
- separating "Preview" and "Program" views of the video mixes
- other scenarios as mobile or HD viewing

multiple playout systems

Stream preparation, Remux, Auto Fallback, Playout, Control
- inline processing
- Program Infocards
- Emergency Fallback Files
- DVB-S,C,T
- Mobile TV
- Mobile Stream
- Flash Web Stream
- Video confer. system

Final Playout
- switching between file based input, (live) stream input, and infocard streams to provide a final decision on the eventual content to be published
- remuxing and streaming
- connecting 3rd-party components such as a MPTS multiplexer for DVB-T or a MPE-encapsulator for DVB-H
- utilizing either the built-in internal streaming capabilities or dedicated stream software (e.g. Wowza or Erlyvideo for Flash video) for Internet or mobile streaming

DVB test bed

internal network

Flash Streaming Server — Internet

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