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ULTRAGRID UPDATE

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CESNET

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- Technology
  - an affordable platform for very high-quality interactive video (up to 8K) and audio transmissions
  - use of commodity (gaming) hardware
    - Linux and Windows PC and Mac OS platforms
    - commodity video capture cards
    - commodity GPU cards
    - commodity sound cards
    - any reasonable network
  - as low latency as possible on commodity hardware
 - open-source software, BSD (GPL) license
- User support, community

- Development towards UltraGrid 1.6
    - 243 files changed, 30150 insertions(+), 34950 deletions(-)
    - Audio reimplementation (including experiments with ASIO backend)
    - New GPUJPEG, arithmetic coder in progress
    - NDI support, AJA display, 12-bit video support, SMPTE VC-5 Cineform support
    - GUI improvements
    - Development towards 360 video support
        - Cameras such as Panasonic 360 Live Cam already available, with limited capabilities and huge latency (398.4±16.6 ms)
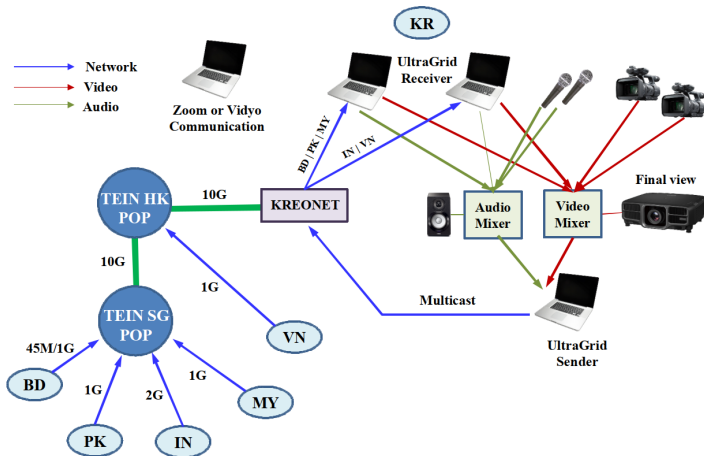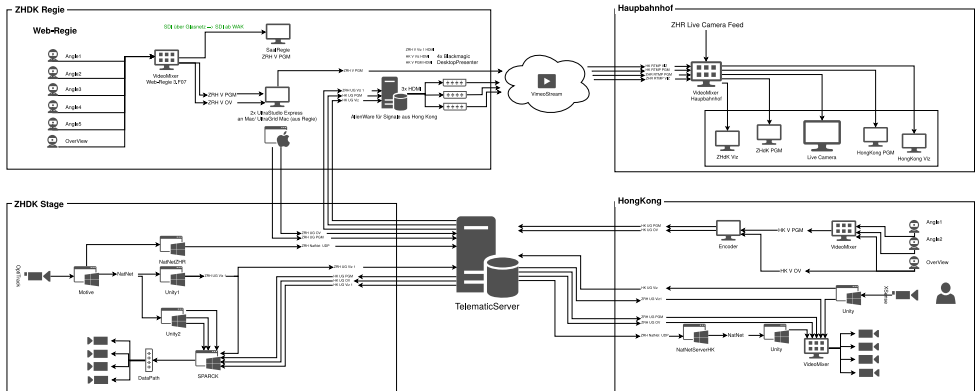
- TwinLab Performance

VideoStreams Version 1.0 (181002)

- This won't be about using SDI/HDMI embedded or analog audio with video capture cards (Blackmagic's etc.)
- Always works as expected
- Audio synchronized with video frames
- Audio latency corresponds to the video framerate (and is higher)
- 60 fps corresponds to 16.6 ms of latency (not end-to-end at all)

- Latency vs. reliability of the transmissions
- We aim on end-to-end audio latency lower than 30ms (on a local network) and keeping the transmission highly reliable even on commodity networks
- Linux, OS X and Windows support
- Literally a major pain
- Many new UltraGrid users in the community helping with testing
    - Intermusic project (Milan Conservatoire + Polytechnic University of Milan),

- Audio is processed per 128 frames by default, can be parametrized
- –param low-latency-audio
    - Try to reduce audio latency at the expense of worse reliability (basically turns off buffering in UltraGrid)
- –param audio-buffer-len=<ms>
    - Sets length of software audio playback buffer (in ms, ALSA/Portaudio)
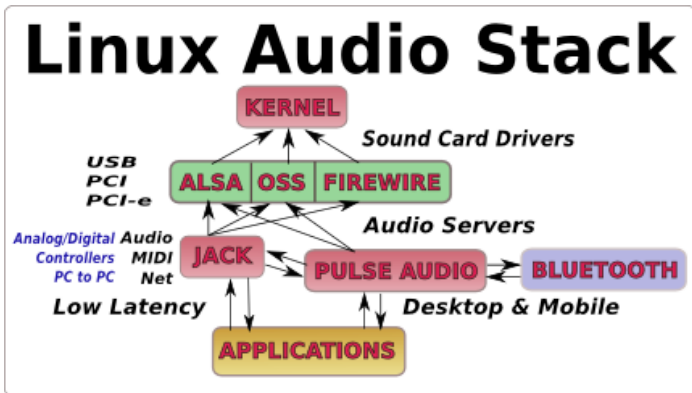
- ALSA
- Pretty stable
- There is still about 5ms playback buffer in Alsa (see –param audio-buffer-len=<ms>)
- There may be still some driver buffer (depends on sound card)
- -s alsa:<device>:opts=frames=32
- Usual end-to-end latencies around 34ms without any fiddling
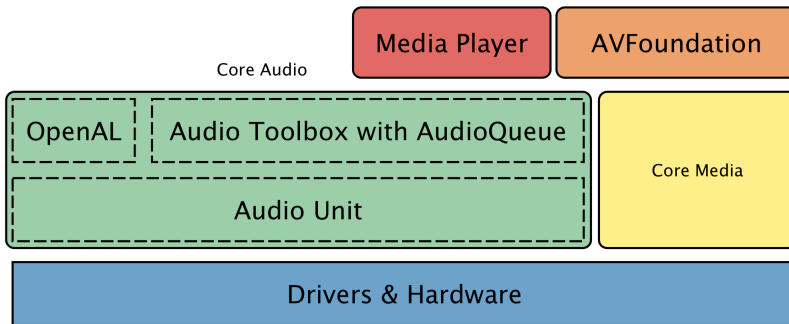
- Coreaudio
- Coreaudio tends to do the "best"for the user
  - In some cases the best option is to process 512 frames at once according to Coreaudio
- The default is explicitly 128 frames now (in nightly versions)
- Can be set using audio-cap-frames Coreaudio param in UltraGrid
- Usual end-to-end latencies around 36ms with nightly versions

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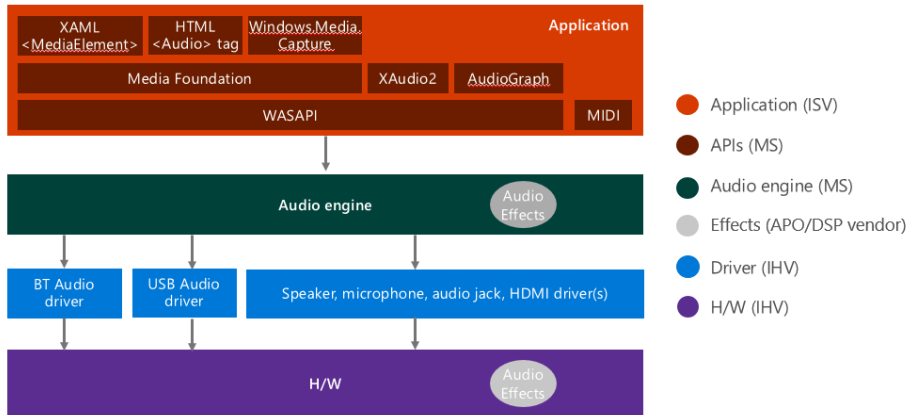
- Chaos and mayhem

- WMME, Direct Sound, WDM/KS, Windows Core Audio, OpenAL, XAudio2, PortAudio, WASAPI, AudioGraph, ASIO

- Portaudio supports WMME, Direct Sound, WDM/KS, WASAPI and ASIO backends
    - WDM/KS mostly broken on devices enumeration
    - Direct Sound works, but has huge latency
    - WASAPI capture/playback broken on some devices
    - ASIO possible but untested and most probably not reliable through Portaudio (ASIO4All worked for us though)

- Under reconstruction
- WASAPI
    - Default audio API on Windows 10 (supported from Windows 7)
    - Microsoft promises low-latency support
    - 3 versions of the API though, only the latest version promises to provide low latency
    - We are already experimenting with direct WASAPI implementation in UltraGrid

Stay tuned and thank you for your attention!

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http://www.ultragrid.cz/
http://www.gitgub.com/CESNET/UltraGrid/
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