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)
OPRAVDOVÍ
Networked Performance
Premiéra 26.9.2018
Trutnov (UFFO)
Plzeň (Moving Station)
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)
Multiplatform Audio Transmissions – Linux
- 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 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.
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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