cesnet

Programmable hardware for distributed performances

Sven Ubik

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Network Performing Arts Production Workshop 2019
• Why programmable hardware for performing arts?
• Examples of practical use
• How to test network paths?
• NPAPW19 performance
Technical requirements:

- Low latency audio and video transmissions
- High quality multiple camera video for audience
Transmission chain

- Camera: 6 – 80 ms
- Encoder: 1 ms – 150 ms
- Decoder: 3 ms – 100 ms
- Projection

Network
• Most electronics now includes programmable hardware

• Elementary hardware components are „organized“ by specification in FPGA or ASIC

• For true real-time, low and constant latency
• Ultra-low latency under 1 ms
• Dual-channel high quality video
• No PC, simple setup and use
• Small, lightweight, easily portable
• Cost comparable to a high-end PC
USB camera:
• Very limited picture quality (small chip and lens)
• Normally one camera only per location
• Fixed view, difficult to zoom, refocus and pan live

SDI/HDMI camera:
• Large selection of studio quality cameras
• Multiple cameras per location easily possible for live coverage
• Easy to pan, zoom, refocus live – television production
• Example: Blackmagic URSA approx. 6 ms latency
For instance to see the musician body and hand movements.
• Commemoration of 20 years anniversary of CESNET
• Prague (Senate Building) – Anerlovo Quartet, strings
• Copenhagen (DKDM) – Bogdan Nikola, piano
• Antonin Dvorak, Piano Quintet No. 2 in A major, Opus 81, 1st or 3rd movement
“A Tribute to the Brave” concert
In association with the award of the Vaclav Havel Prize for Human Rights in 2018
Musicians and audience in Prague (church of St. Anne, Prague Crossroads) and Bratislava (Performing Arts Academy)
Vaclav Havel Library, AMU, VŠMU and CESNET
8 cameras, 3 live edits production, national TV broadcast
cesnet  A Tribute to the Brave concert
Testing network paths

- Network performance measurement tools – iperf, Speedtest, etc.
- Nothing replaces an end-to-end test transmission with real equipment
Packet reflector

- Reflects packets to specified IP address
- 100% line-rate, zero packet loss
- Very small, lightweight, easy to mail
- Automatic configuration
- Available under research collaboration or for purchase
NPAPW19 performance

• "I wish I would dance well under the stars"
• Based on Marek Orko Vácha book
• Three organs – in the venue and in two churches in Prague
• Dance – in the venue and in Konic Thtr Barcelona
• „Holographic“ telepresence from Barcelona
• 10 cameras, 3 live edits production

Sts. Simon and Juda church  St. Laurence church
Thank you for your attention

Questions?

Sven Ubik, ubik@cesnet.cz