

Supporting Scalable Telematic Music and Mixed Media Productions with UltraGrid

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Telematic music is a live performance where the musicians in different locations are connected using the Internet and performing together. The community of artists is well established around the world in this field. A paramount parameter for the telematic music performances is the end-to-end latency of the media transmissions. It is not uncommon that achieving as low latency as possible is traded for other parameters of the transmission such as the necessity to utilise higher bandwidth or lower the quality of transmitted video. To be able to achieve a perfectly synchronous performance it is necessary to provide the artists as low latency as possible. The latency requirements differ substantially for different arts. With classical music it is not uncommon that the musicians seek end-to-end latencies lower than 30 ms which for the musicians equals to playing together in a same room at a physical distance of 10 meters. Other types of arts such as jazz music or mixed arts including dance or theatrical performances introduce much lower upper-bound end-to-end latency requirements.

The community has a range of tools to produce the networked performances at hand. LOLA, developed by GARR, becomes a primary tool of choice for many as it provides both audio and video transmissions, is tailored specifically for performing arts of computer networks taking into the account especially the latency requirements of the musicians seeking synchronous performance at the distant sites. Through usage of specific PC hardware and precise parametrization of the media transmissions LOLA provides unparalleled end-to-end latencies. Another tool featuring both high-quality audio and video transmissions is the MVTP-4K (Modular Video Transfer Platform) hardware platform developed by CESNET. MVTP-4K provides internal processing latency lower than 1 ms. A very well anchored tool within the telematic music performances communities is the Jacktrip developed by the CCRMA at the Stanford university. While being only audio transmission tool, Jacktrip provides high flexibility for deployment in variety of multipoint audio transmission scenarios and can be fine-tuned in order to achieve very low end-to-end latencies.

Last but not least, the community has partially adopted the UltraGrid software platform for very high-quality and low-latency video and audio transmissions over IP networks. Although UltraGrid was never designed to primarily fulfill the needs of the community performing telematic music performances, its usage in the community is still rising. UltraGrid deployment is completely based on usage of commodity, of-the-shelf hardware. While it can not directly compete with LOLA or MVTP-4K in achieving as low latencies as possible, UltraGrid is still capable of achieving end-to-end latencies lower than 20 ms for audio and between 50 and 150 ms for video. At the cost of higher end-to-end latencies UltraGrid introduces unparalleled scalability and flexibility for deployment in very different scenarios.

In this presentation we discuss two rather different use cases of the UltraGrid deployment for the telematic music production and show that UltraGrid based productions are very flexible and

scalable alternative for telematic music and mixed media productions when compared to more traditional tools. We provide both technological insight in different networked arts productions as well as discuss the role of the UltraGrid team as the technology provider within the artistic communities besides the providing of direct technical support.

SFJAZZ, a cultural institution devoted to jazz and similar forms of music presentation and education has adopted UltraGrid in 2015. Since then it has been used for various different networked performances. In October 2015 SFJAZZ together with the CENIC network commenced a program bringing telematic jazz performance into the public libraries in California connected through the CENIC network. The project is still ongoing bringing forward some major challenges. An important component of the project is to ensure that even public libraries can technically perform optimally in the telematic performance generally with a very limited resources and lack of technical knowledge and sometimes even technical staff. One of the most important aspect of this project is to create a viable community and links between the UltraGrid team, SFJAZZ and the CENIC network and the libraries so that the technological know-how is eventually passed from the UltraGrid team to SFJAZZ and CENIC respectively. An ongoing activity is to create and maintain a tiered requirements matrix defining the possible level of the libraries participation in different telematic performances as well as a baseline equipment matching the participation level. This is exactly a task for a technology provider such as the UltraGrid team in this particular case and a topic where the technology provider and the artists meet. The limited resources also pose a valuable feedback and new challenges for the UltraGrid development. The aim is to allow for a basic telematic interactions using even very basic off-the-shelf hardware, such as laptops and webcams while still maintaining a good quality of the transmitted media and a reasonable latency provided the characteristics of the jazz performances.

A completely different use case is deploying UltraGrid for one-time, large scale telematic and mixed media performances including music, dance and art such as the past net:art productions and the upcoming process yourself production for the TNC17 programme. The last net:art near in the distance was a very large scale high-end production involving more than 120 persons at multiple sites which are generally involved in another similar productions and thus usually posses high-quality equipment and a good deal of know-how. The process yourself production is planned to be smaller than the previous net:art near in the distance. However, the main features of the production will be similar. All the remote sites will be well equipped, staffed and technologically advanced. Even in such a scenario the role of the UltraGrid team as one of the technology providers remains the same as in the previously described case. That is to to help the artistic community to define the equipment and technology for the production and help to leverage the flexibility of UltraGrid to provide the best artistic experience possible.