

The Mythos Project: a distance learning experience in the field of lyric music

Piero Castoldi*, Andrea Morelli*, Paola Vascelli**

* National Inter-university Consortium for Telecommunications (CNIT), Parco Area delle Scienze 181/A, 43100-Parma, Italy. E-mail: piero.castoldi@cnit.it, andrea.morelli@cnit.it

** The “Arturo Toscanini” Foundation, Via Tartini 13, 43100 - Parma, Italy. E-mail: formazione@fondazione-toscanini.it

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ABSTRACT – The paper describes a **distance learning** experience in the field of lyric music operated by the *CNIT* consortium on a experimental terrestrial **QoS-guaranteed IP telecommunication network** in collaboration with the *Arturo Toscanini* foundation and *Sinform*, a consortium of institution that operates in the area of vocational training. Within the Mythos project, live classes for orchestra and chorus both at the individual and group level have taken place being the instructor (orchestra director) and the musicians (orchestra) in remote locations. The technical and artistic issues of this critical tele-teaching application have been identified and the relevant problems solved.

1. INTRODUCTION

Thanks to the financial support of the Emilia Romagna region (through European Social Fund), the “Arturo Toscanini” foundation jointly with CNIT and Sinform launched the Mythos project, a distance learning program in the field and of lyric opera. The Mythos project, started in November 2000 and will terminate in December 2002. It is composed of two main parts: one concerning traditional teaching methods through face to face lecture and Web Based Training and the other concerning the most up to date technologies applied to teaching, i.e. *live* remote teaching using advanced telecommunication infrastructures [1]. The project is aimed at realizing a vocational training program for opera singers and professors that allows to attend live lecture from famous directors that can teach at one or more remote audience without physically moving to the class location.

CNIT has worked on the development of the infrastructure necessary to implement the distance learning application. This does not involve only interconnecting the teaching sites using a innovative IP-based telecommunications network, but also identifying the most appropriate tools for critical applications, as real-time ones (videoconference), and for those which need students to access media data base in order to get information of interest.

Four types of lessons have been tested and identified:

- **Lecture:** when the teacher explains in theory how to apply techniques or how to execute given exercises
- **Performance:** when the teacher plays an excerpt in order to demonstrate practical application of interpretation
- **Face to face:** the teacher directs the student while he’s playing an excerpt
- **Class in progress:** the teacher directs all the students playing together

Finally, CNIT has given support to phoniatrics and musical contents experts in order to perform audio signal analysis both in time and frequency domain, from which many sound and specially voice features can be obtained.

2. THE ADVANCED DISTANCE LEARNING PLATFORM

The network is a star network with central node in Naples (CNIT Laboratory of Multimedia Communications equipped with a Cisco 7500 Router). Actually there are three active links with 2 Mb/s peak bandwidth (1 Mbps guaranteed) provided by a national carrier: (i) CNIT Parma Research unit (equipped with a Cisco 3640 Router); (ii) Sinform resource center (equipped with a Cisco 3620

Router); (iii) Theater G.Verdi of Busseto (equipped with a Cisco 3620 Router). There are other theatres interested in the project; they could enter later and increase the number of potential customers of the learning services.

Three main points have been studied for an efficient delivery of the service: the support to IP multicast, the support of nominal and perceived QoS, the characteristics of the audio/video application tools.

A complete IP multicast support is necessary to better exploit network resources, mainly concerning bandwidth utilisation. Multicast is the act of sending a message to multiple receivers by using a single local "transmit" operation. It is fundamental in this context. In a wide-area network, each host, wishing to participate to a multicast session, must first inform the local multicast router of its desire to join the group by using the Internet Group Management Protocol (IGMP) [2]. The local router can interact with other routers to receive multicast packets. It uses a Multicast routing protocol. IGMP version 2 has been activated at host level and PIM Dense Mode [2] has been configured within each network router.

The audio-video conference tools must guarantee a high level of interactivity within this special training environment. In this case, the equipment for all sites is similar and consists of audio/video acquisition peripherals and one signal encoder-decoder (Codec). This codec can be both a PC equipped with videoconference software or a dedicated hardware device. Many IP-based video conference applications have been compared in terms of audio and video quality, required bandwidth and encoding/decoding delay (interaction round trip). The MBONE tools (VIC, RAT, and SDR) have been used [2].

Concerning the QoS support, the network is based on ATM links with VRB-nrt class of service having 2 Mb/s of peak bit rate and 1 Mb/s of guaranteed bit rate. The QoS is also affected by the propagation delay that does not allow a perfect synchronization between director and orchestra. Particular attention has been devoted to reduce both the bad effects of absolute delay and jitter.

3. CONCLUSIONS

The technical issues, as well as the educational impact of the project constitute an important step in the growth of the consortium expertise in the area of remote teaching. The fundamental elements of the experience can be summarized in the following items: (i) the distance learning tools must provide a high degree of interactivity between the teacher and the students; (ii) terrestrial networks are capable of a satisfactory media delivery over large distribution areas; (iii) in order to obtain a useful teacher-student interaction the number of active (non receiving only) students must be limited and for this purpose full IP-Multicast conferencing tools are optimal choices.

References

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VITAE

Piero Castoldi holds a Ph.D. in Information Engineering. He is currently associate professor in Telecommunications at Scuola Superiore Sant'Anna, Pisa, Italy. He is also affiliated to the National Inter-university Consortium for Telecommunications (CNIT) as a project manager.

Andrea Morelli holds a Laurea degree in Electrical Engineering from the University of Parma. He is currently a Researcher at the National Inter-university Consortium for Telecommunications (CNIT).

Paola Vascelli is responsible of the vocational training division of the "Arturo Toscanini" foundation, an institution that operates in the area of education for opera professor and singer.