The Performing Arts Networking meets new Users and Challenges

Text: **Claudio Allocchio**

High-performance networks are developing into a new powerful tool, changing the way organizations involved in the performing arts work and opening up new challenges and opportunities. This requires engineers to reconsider the network planning too. It's time to join the club for this new adventure in technology, arts and innovation.

A music student's day on Feb 1, 2011: «10am violin lesson; 11am rehearsal with the London Royal College of Music Orchestra; 1pm lunch with Anna, seaside café; 3pm Master Class, Manhattan School of Music; 5pm meeting friends at home».

Science fiction? No! While teletransport has still not been invented, the Research and Education Networks are there, and the performing arts community using them is well aware of the fact that this is just «straightforward reality».

High-performance networking is no longer the privilege of a restricted set of scientific disciplines; dark fibers are reaching Higher Education and Research sites, including Arts and Humanities departments, and the performing arts academies are also getting into the loop. But even where network capacity is not so big, there are still many possibilities that call for just an affordable small effort. In many cases, it is more a matter of information-sharing, learning, and willingness to try innovations than pure technology.

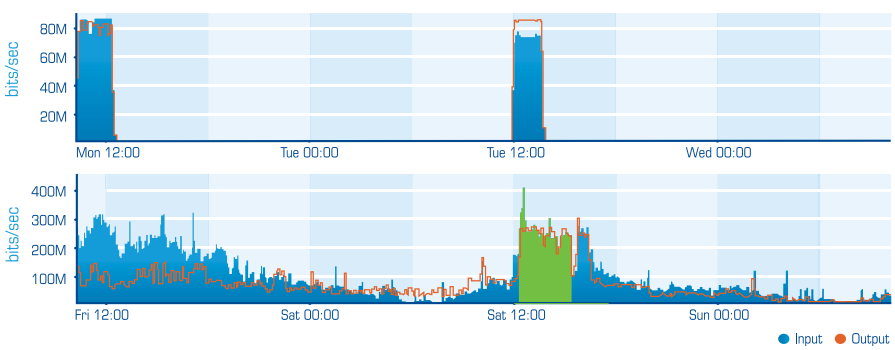
Pioneers started experimenting in the mid-90s already, but the situation has now matured to the point where it is ready for production services: a student can span his day across three continents without leaving home, a musician can rehearse her next tournée concerts in different cities all in a single day while teaching at her home institution, and all the other performing arts can similarly make use of the new tools. The traditional concept of «unity of space» has thus expanded further, making one famous viola player really happy: A few years ago, he in fact complained about all the times he had to say «sorry, I can't do that», because he just had no time and didn't want to take his 1Meuro XVI-century instrument across the ocean too often.

A new community sharing innovation

A variety of tools can be used with advanced networks to open up new possibilities: from enhancements of legacy videoconferencing systems, via the re-engineering of DVTS (Digital Video Transport System) and CXP (Microsoft Research Conference XP), to custom built applications like Audio JackTrip, LOLA (Low Latency Audio Visual System), or EchoDamp (a highly efficient acoustic echo supressor). These tools came into existence thanks to the interaction between the performing arts community (artists, teachers, students), audio and video engineers and hi-end networking experts. They somehow all speak a different language, but when they meet up and share their requirements, knowledge and ideas, a great deal of innovation becomes possible. It is very unlikely that a musician will say «there is too much jitter»; his comment will be «I hear some subtle audio clicks», but the network engineer will switch on the network-monitoring tools, check the jitter and packet loss end-to-end and, where appropriate, alert the Performance Emergency Response Team to fix the problem.

Where to get more information

- → **The Network Performing Arts Workshops and Initiatives (TERENA and Internet2):** www.terena.org/activities/network-arts/
- → **The Internet2 Arts and Humanities initiatives:** www.internet2.edu/arts/
- → **The GARR TV Performing Arts videos and channel (in Italian):** www.garr.it/garr-tv/news/12-musica-a-distanza-in-rete
- → **DVTS:** www.nws.edu/internet2/
- → **CXP:** cct.cs.washington.edu/downloads/CXP/
- → **LOLA (partly in Italian):** www.conservatorio.trieste.it/artistica/ricerca/progetto-lola-low-latency



The traffic graphs generated by a remote «playing together» session.

On the other hand, the performing arts community can now explore, create and deploy new ideas in areas which were just «impossible» before: mixing the acoustic ambience of different Concert Halls which are being used jointly for the first time ever for a concert, or creating distributed visual art installations, to give just a few examples. It is a virtuous circle, with innovation creating further innovation, which then can be applied in other fields like remote control applications or remote health services.

The Trevisan-Zaccaria piano duo performing Bach's Brandenburg concertos, at 1200 km away from each other.

The networking challenge

If a Network Operation Centre engineer, or a Security expert looks at the traffic graphs (MRTG and NetFlow outputs, see on page 22) they will most likely think either of a traffic anomaly (a high IN and OUT with an almost precise overlap on a backbone link on a Saturday, plus a single flow eating a lot of bandwidth), or a security problem: indeed the graphs do not even look like the classic high data transfers which the LHC community got them used to. But... it was just a couple of real-time «playing together» sessions using LOLA – see the picture on the right – the low latency audio/video system.

Operational team training is a minor challenge anyhow; making the network «friendly» for performing arts users is more complex. We should first check the requirements listed by the radio astronomers from eVLBI sites: all the work which was done for them can just be re-applied (simply replacing the data output of a 20m diameter antenna with the one from an orchestra playing Mozart). But latency, for example, also depends on networking equipment, and the physical length of fibers: a 600 km fiber is a few milliseconds «longer» than a 400 km one, and equipment applying lots of actions on data packets is likely to be slower than equipment with a dedicated service for certain special flows. None of our current networks was engineered with these requirements in mind: we shall not be forgetting them from now on.

Why and how: join the club?

Is there a further digital-divide risk on the horizon in this new scenario? If an education institution in the performing arts field does not take up these new opportunities right now, acquiring the necessary expertise within their institution, they will be rapidly at risk of being excluded from the circle, and the gap will become increasingly difficult to overcome. There is no need to become a technology-savvy user to take up new methods of teaching, learning, and working: many people already involved are happily ignorant of what a DWDM service on a dark fiber is, but they still use it nonetheless.

Then there is also the risk of an artistic and educational divide: the ability to access outstanding individuals, groups or facilities can clearly make a difference.

Indeed, we are still at the outset of production deployment for a large number of services, and hence getting up to speed does not constitute a problem as yet. A number of initiatives exist to provide support: in North America, Internet2 and the New World Symphony have been running a successful series of dedicated workshops, and a number of NRENs in Europe have specific activities too. In 2009 TERENA and Internet2, with the support of GARR, started to jointly organize their workshops in Europe as well, in a coordinated effort: the next workshop is scheduled for June 2011 in Barcelona: a good opportunity to seize! Furthermore, there are many other initiatives which can be spun off, some also aiming at EU support for deployment. Stay tuned to the TERENA and Internet2-dedicated pages!

Claudio Allocchio

Claudio Allocchio studied not only astrophysics and particle physics, but also music (piano). In 1985, he started his computer networking activities at CERN and then returned to Trieste (1988). Among the founders of GARR, the Italian NREN, he managed the COSINE mail gateway services (early 90s) and the Italian Naming Authority (the «.it» regulator). Since 1991, he has been a member of the application area directorate at IETF. He is the GARR senior technical director for advanced applications and security areas.