



INNOVATION REPORT

A first step toward the IP-based TV production studio

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Project positioning

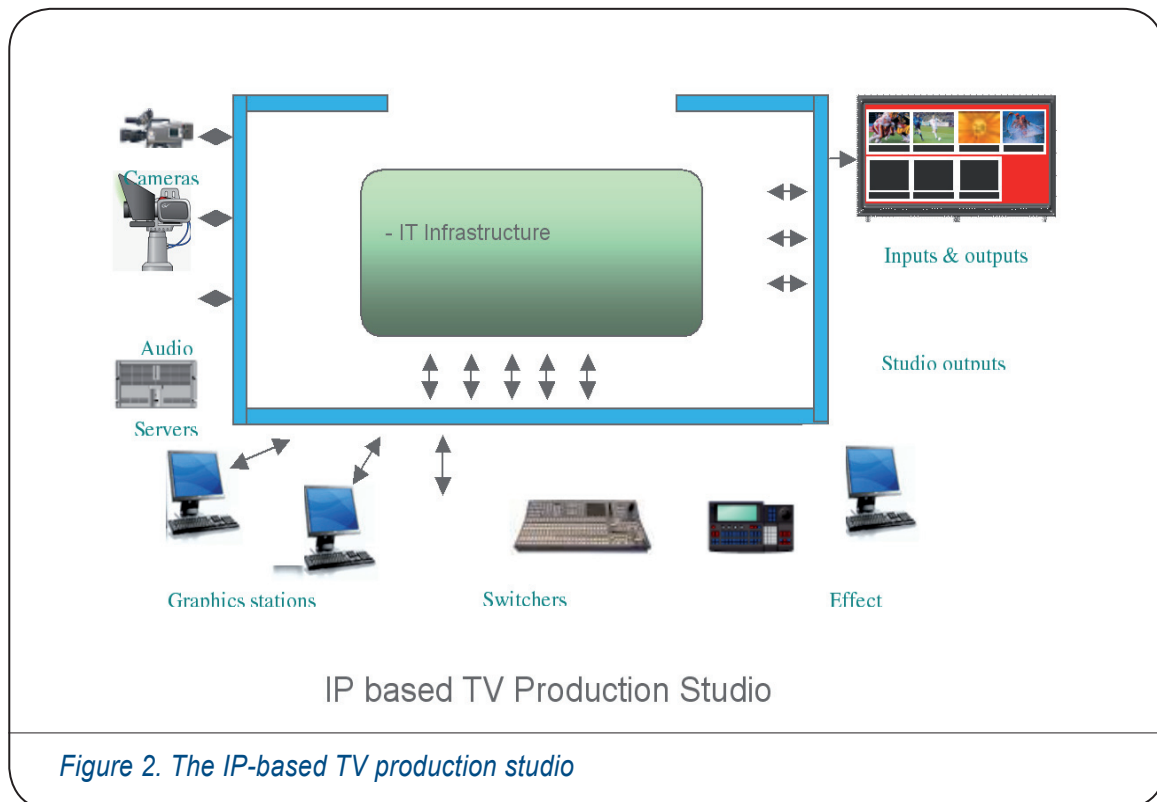
PELOPS addressed a field of innovation in the content-creation area for live events. It related to networked studio and content-based analysis tools for live production and publication, specifically in the sports domain.

One strand of the PELOPS research domain concerned IP-based interconnections and data networking technology to support enrichment of the content with associated metadata and their transport over the same infrastructure for immediate as well as later use. A second strand of PELOPS concerned signal monitoring, where novel methods were researched to display a large amount of video in combination with computer-generated images in an attempt to reduce the complexity and the cost of contemporary multiviewer systems.



Figure 1. Meeting the needs of TV networking

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Historical perspective

Those who have lived the digital TV and then the HDTV revolutions have experienced how much the format influences the production environment. A new format means a new production infrastructure and a new generation of equipments and ... new investments for TV channels and content producers.

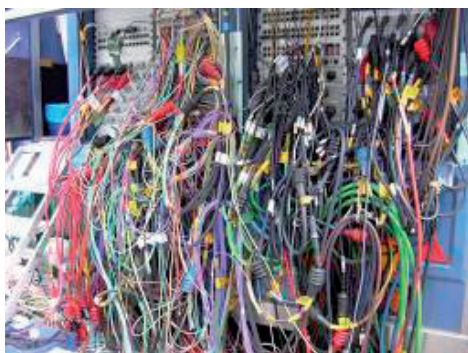


Figure 3. Cabling in a modern TV studio

A large amount of equipment coexists in a studio: cameras, servers, video routers, video switchers, audio mixers.... This gear is interconnected by dedicated point-to-point links using interfaces dependent on the format of the audio-video material. A set of additional signals are distributed to ensure equipment control and support for efficient programme production. This technology currently leads to a mass of cables as shown in Figure 3.

Technical trends - IT convergence

On the one hand, due to the convergence of technologies, many sources of pictures exist: TV/PC, SD/HD, interlaced/progressive, On the other hand, the cost of the connectivity – based on the Internet Protocol – is decreasing dramatically. Furthermore, it is not economically viable for content producers to renew their infrastructure each time a new standard is decided.

Consequently, the use of Ethernet/IP technology is beginning to move the studio from a format/hardware-centred approach toward a network/software-centred one. It is something that gets the job



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done simply and reliably, but also makes the studio ready to move into a future that will require more than video- and audio-signal processing. It means a unique link to convey multiple video and audio signals, control and programme-associated data, VoIP and general computer data.

Technical challenges and achievements

The challenges are huge to migrate from the format/hardware-centred approach to the network/software-centred one. Some of the biggest are:

- Defining and characterising a suitable IP-based architecture for real-time video production;
- Defining an efficient synchronisation system to replace the conventional signal, allowing all studio equipment to be synchronised so that pictures can be mixed and switched seamlessly;
- Defining a studio software-management tool to ensure the necessary quality of service – high bandwidth, low latency and low jitter – over the IP network; and
- Defining a distributed monitoring platform using off-the-shelf PC display components and technology.

Even with the arrival of giga-Ethernet equipment, bandwidth remains a scarce resource, especially when dealing with high quality video streams. Within the PELOPS project, bandwidth requirements were brought back to sensible values by using a visually lossless compression technique – JPEG 2000 – in combination with a layered packetisation scheme.

As already mentioned, the synchronisation of the studio equipment must be very accurate; at the pixel level to ensure seamless images compositing. The main difficulty in synchronising equipment over an Ethernet/IP network comes from the packet-transmission time, which is not a constant. The IEEE 1588 standard together with a further jitter-filtering mechanism developed by the project was successfully experimented in PELOPS. It provides an accurate network-timing service.

It was also demonstrated that the combination of the IT networks technology with the high end graphical processors (GPU) used in today's PC gaming platforms can provide an effective solution to build enhanced monitoring systems.

Furthermore, the results of the research achieved within PELOPS on synchronisation and video IP encapsulation have been taken to the IEEE (802.1AVB) and IETF (AVT) standardisation bodies.

New business opportunities

The arrival of new production formats is a real opportunity to switch to IP technologies in the studio, in a global media technology industry market which is expected to reach more than € 13 billion in 2010 and where PELOPS partners intend to increase their revenue, benefiting from the studies done in the project.

The introduction of IP technology in the studio will start by providing external IP interfaces to current existing products – cameras, video switchers, VTRs, video servers ... – to cope with legacy. In a second step, these interfaces will be integrated in the products to go one step beyond in cost reduction. The cost of a control room can be reduced dramatically by an efficient use of cost-effective IP switches which can carry more than one signal compared with the expensive high bandwidth video router used traditionally.

The monitoring multiviewer controller itself can also benefit from the high visualisation power of current gaming PC technology, thus reducing the price of the video monitoring system. A new product called 'Networked Digital Studio' was designed by one of the PELOPS partners, based on the technologies



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developed in the project. The first pieces of equipment are already in place at some alpha and beta customer sites, showing that IT-based solutions are finding acceptance in the broadcast community and paving the way for a market with high potential.

Future

Research in the domain of studio infrastructure is actually speeding up with the convergence between video and IT networks. Another driver is the arrival of HDTV, which requires more powerful infrastructures. The concurrent existence of standard and high definition as well as the arrival of new formats (1080 p, 2K, 4K, ...) demands the development of a format-independent infrastructure.

In the IT world, telecommunications applications foster the development of extremely powerful components for routing data streams while continuously improving quality-of-service capabilities. The telecommunications operators have not been concerned up to now with transportation of video, but are beginning to consider this type of application as it would significantly increase their revenues. It should thus boost the technology and make it reach a level of performance in the future where it could be used in the control room, meeting the strong quality-of-service requirements.

The technologies developed in PELOPS around the IP infrastructure are key items to help the development of this business. The successful co-operation in the PELOPS consortium is expected to carry on inside the TVPRODNEXT project.