Streaming technology - How does it affect education?

Report from a project using satellite-based communication

Anton Knierzinger, Caroline Weigner and Bernhard Collini-Nocker

Paedagogische Akademie der Diözese Linz and Education Highway Linz, Austria

Institute for Computer Sciences, University of Salzburg, Austria

Abstract: The prime aim of the AVD project is to investigate the potentialities of specific technologies for education. In particular the project addresses: media-on-demand services for schools, new ways of active use of media by students, interactive TV as the synchronous part of an e-Learning environment.

Key words: the learning market, teacher education, internet, streaming technology, broadcasting technology, digital media

1. INTRODUCTION

In 2001 the Austrian Federal Ministry of Education and TELEKOM Austria agreed upon the sponsorship of a large research and development project aiming to study the potentialities of streaming technology in education and to develop suitable applications for Austrian schools. A hundred schools out of 6200 schools in Austria are currently provided with the equipment necessary to receive signals from the satellite.

Streaming technology and satellite communication offer three main benefits:

- a) Fast internet connection for schools where other means of IP-based communication is not available.
- b) Media-on-demand solutions: the project is developing a media-on-demand solution showing the potential of digital media.
- c) Synchronous e-learning applications: interactive TV is used as the synchronous part of a hybrid course organisation (e-learning by mixing asynchronous with synchronous elements).

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2. BROADCASTING AND STREAMING TECHNOLOGY

Direct broadcast satellite using DVB/MPEG-2 standards can provide ubiquitous high-speed IP services with wide-area coverage at moderate costs and without need of a permanent return link. Contrary to terrestrial wide area networks, satellites perform much better for broadband multicast services. The wide area coverage and availability in non-metropolitan areas make satellite IP/DVB-based applications ideally suited for remote educational and training purposes. Both video streaming, multicast caching of web objects, and multicast delivery of questions and answers on the forward link are combined with an optional, yet low-speed internet return link utilising UDP.

In order to attract people to distance learning lessons you have to include video, audio, animations, high-colour graphics and well-formatted text. The WWW can provide this type of content, but the access speed of most people to the internet is insufficient to obtain the material live or in reasonable time.

In 1998 the Institute of Computer Sciences at the University of Salzburg developed software for interactive IP-multicast distribution of web content. This software was named SIMPLE, which stands for Satellite Interactive Multimedia Plattform for Lowcost Earth-stations. This software is a proxy solution that provides both multicast proxy functionality to interactively access the web and multicast cache functionality to store and access pushed web objects later on.

SIMPLE is a software system for direct broadcast multimedia satellite systems based on internet protocols and offers multicast web caching and replication services as well as pure internet push services. SIMPLE provides proxy/cache functionality at the client side (single-user or multi-user station) and makes use of reliable high-speed proxy-to-proxy communication via UDP/IP-multicast to deliver web content to authorised cache/replication sites. The potential clients can be individual users (DTH), user communities (LAN) or internet service providers (ISP) such as campus network operators or ADSL islands.

3. TECHNICAL INFRASTRUCTURE

In the centre in Linz run by EDUCATION HIGHWAY we operate the video studio as well as the media server. Via satellite, the data is transmitted to the school. The metadata describing the video material is filesaved on the Virage server run by IVS in Vienna where also the encoding of the video material is undertaken. Each school is provided with a proxy server and a

satellite antenna. The proxy server should be integrated in the school network so that the workstations in school have access via the proxy server.

Figure 1. Technical infrastructure

4. MEDIA-ON-DEMAND AND E-LEARNING

We can show in this project that the transport of media can easily operate through a broadcasting system. We encode the media using different bit rates, which allows us to offer teachers a search and select medium from home where in most cases a broadband connection is not available. In addition to the medium itself, you can find more information on the topic the medium is dealing with, the complete transcription of the speaker's text, manually selected key frames and additional material coming from different sources on the internet. The teacher then selects which media should be transmitted to the school.

We widened our work to investigate new possibilities which this technology offers for classroom use. Teachers and students have immediate access to a set of media stored on the proxy server in the school. Digital media allows active work with the media by students either individually or in small groups. The technology used in this project offers the possibility to search for parts of videos (frames).

5. CONCLUSIONS

As the project has not yet been completed the final outcome can not yet be predicted, but we see clear evidence for the following conclusions:

1. We see that streaming technology offers possibilities for a new kind of handling of media in the classroom. It changes the nature of working with media in classrooms towards active use rather than passive consumption.
 2. The integration of broadcasting technology into e-Learning projects leads to a better acceptance of this kind of training only if there is a feedback channel which can be used for interactive participation by the learners.
- Further development of the project will be documented on the web-site at <http://avd.eduhi.at>.

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BIOGRAPHIES

Bernhard Collini-Nocker finished his Ph.D. studies of informatics at the University of Salzburg in 1999. Currently he is associate professor at the Institute of Informatics at the University of Salzburg. **Anton Knierzinger**, after studying physics and mathematics at the University of Vienna, worked for eight years as a school teacher in Linz. In 1986 he moved to the Paedagogische Akademie der Dioezese Linz, where he is now heading the Department for Media and Information Technology. **Caroline Weigner** finished her studies in 2000 at the Paedagogische Akademie der Dioezese in Linz and then started working for the Education Highway institute.