

Streaming video: some practicalities

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Background

There are a number of difficulties in using videos and animations in learning and teaching packages, e.g., students lose them, fail to return them on time, and damage VHS tapes, CD-ROMs and DVDs. Additionally, it is not always possible for students to obtain access to such materials when they want them, e.g., laser video discs can only be accessed on site, the download times for video material from the Internet can be very long especially at certain times of the day, and material taken directly from the Internet is often not specific to the student's needs.

An answer to these difficulties is to deliver, i.e., 'stream', the appropriate video and audio material, subject to copyright clearance and licensing, on the institution's Intranet. A number of sources, e.g., British Universities Film and Video Council (<http://www.bufvc.ac.uk/>), have described and discussed the background to this topic in considerable detail and the names of commercial companies, which can provide 'streaming' services, are available via the BUFVC web site.

At Southampton we have delivered the videos on 'Practical Laboratory Chemistry', produced by the Chemistry Video Consortium (<http://www.chemistry.soton.ac.uk/cvc/>), over a local 100Mbps network by two routes. In this Technical Note we shall not discuss the theoretical aspects of 'streaming' (see above) but rather we shall describe our practical experiences, which we hope will be useful.

'Practical Laboratory Chemistry' videos

'Practical Laboratory Chemistry' was produced in CD-ROM format in 1999 from a video series 'Basic Laboratory Chemistry' (1995/96; 19 VHS tapes/laser video discs with barcode booklets; 9.5 hours video; Betacam SP quality, i.e., broadcast quality). The series of CD-ROMs (19 discs; obtainable from Viewtech Educational Media; <http://www.viewtech.co.uk/>) corresponds exactly with the original videos and comprises more than 80 experiments and techniques covering all aspects of basic practical Chemistry. The videos (Betacam SP) underwent compression (MPEG1) to produce the videos for the CD-ROMs with resulting SVHS/VHS quality and where the user can access full programs or parts of programs. For example, 'Solvent Extraction' comprises: choosing a separating funnel, safety points, the ratio of sample to solvent, extracting with less dense solvents, washing with brine solution, extracting with denser solvents and drying extracts.

Delivering 'Practical Laboratory Chemistry'

'Practical Laboratory Chemistry' has been delivered in two ways:

1. By loading the CD-ROMs directly into a dedicated server which can be downloaded by Southampton students and staff via the University of Southampton Network. This Network is accessible to Southampton users from anywhere but cannot be accessed by external Internet users. These MPEG1 files provide pictures at VHS quality (see below) and can be played at 'regular size' and at 'full screen'. The latter provides images which are acceptable for large screen projections, e.g., in a lecture theatre. The files are quite large, e.g., from approximately 10MB to 260MB. The first demonstration (see below; 7m 20s video; B1.mpg) corresponds to 145Mb.
2. By re-encoding the MPEG1 files to *Windows Media* format, uploading them onto a *Windows Media Server* on the Southampton University Network, and restricting access to University staff and students. In this case the file size is much smaller. The second demonstration (7m 20s video; B1.wmv), which is the same clip as the first one, corresponds to 21Mb. These files, however, still give acceptable 'full screen' pictures and for projection in a lecture theatre.

The minimum conditions and configurations for play back under both regimes are: *Windows Media Player 6.4*; Pentium 90MHZ processor; 16MB RAM; 16-colour display card; 16-bit sound card; headphones or speakers; LAN connection; *Windows 95*.

Access the web sites below to see examples of the same video clip under the two regimes.

‘Progressive download’

http://dept.chem.soton.ac.uk/plc/B2_1.mpg

‘Streaming’

http://www.iss.soton.ac.uk/development/e.media/media/B2_1.wvx

Technical specifications

The technical specifications of the two regimes are:

1. ‘Progressive download’ via a Dedicated Server

Host system:

Custom built server commissioned 1999/2000 based on Single Pentium PIII Processor 500MHz

528M Memory

Asus Dual processor motherboard

Intel Pro100 + Server Adapter NIC

Adaptec 29160N Controller

2 x IBM DDYS-T36950 N Hard Drives 36GB each

Software:

Novell Netware v5.1 sp6 NDS v8.85

Novell Enterprise Web server v 5.10f

Set up cost/time:

Time to built and install server and upload files approximately 3 days

Cost for server hardware approx £1000

Novell Netware software provided to departments at no cost

2. ‘Streaming’ via a *Windows Media Server*

Media files suitable for streaming were re-encoded from MPEG1 files using

Media Cleaner XL ver 6.0.3 service pack 2 (available from <http://www.discreet.com/>) installed on a Dell 350, Pentium 4, 1GB RAM, running *Windows XP*.

Video Codec:

Windows Media MPEG-4 Video V3, 350kbps, 320x240

Audio Codec:

Windows Media Audio 9, 32kbps, 44kHz, mono

Uploaded to *Windows Media Server 2003 Standard Edition* running on a Viglen PC with Pentium III, 2GB RAM.

Set up costs/time:

Download MPEG1 file from website: 15s per file, applying encoding settings and metadata in *CleanerXL*: 30s per file, encoding time: 7m for a 7MB file, upload to Server: 10s, configuring Publishing Point: 30s, apply security permissions: 30s.

The 98 files in this series took approximately 17 hours to process.

Dell360: £1044

CleanerXL: £525

Viglen server: £450

Concluding remarks

Either system can be used to provide courseware material for any subject. Such material can be enhanced by being incorporated into a courseware management system, e.g., *Blackboard* and *WebCT*, to enable the inclusion of background theory, quizzes and worked examples in the case of the original ‘Practical Laboratory Chemistry’ CD-ROMs. In this way resources customised to actual needs can be produced rather than students having to plough through irrelevant materials.

The two systems can also be used to help with the management of an institution’s archive of ‘master’ images because when users accesses the ‘master’ images there is always the possibility that the ‘master’ material can be damaged. Accessing the same material for reviewing purposes via a ‘streaming’ system, while the image quality is lower, the access time is faster and the ‘master’ images are not degraded.