

Overcoming Challenges for Effective Multimedia Delivery

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The University of Alcalá¹ and the Spanish Agency for International Cooperation² has undertaken an innovative e-learning and Digital Campus³ pilot project at Mekelle University⁴, Ethiopia. Since August 2009, the project has trained Mekelle University lecturers in using the Moodle course management system to create 50 online courses available to over 1000 students in the College of Health Sciences and Institute of Technology. In developing these courses the project team and lecturers have coped with numerous technical and infrastructure challenges, here we will detail some of the challenges faced in delivering quality multimedia content and possible strategies for dealing with this.

Encouraging the Use and Re-Use of Open Multimedia Content

The large rise in the availability and quality of Open Educational Resources (OERs) opens up a huge resource base of freely available, high quality content. Video content can be expensive and time-consuming to produce, requiring relatively expensive hardware such digital video cameras. Specialised skills and software are needed to create a quality resource, especially in the case of interactive multimedia content, such as Flash animations. Yet it is straightforward to integrate creative commons licensed multimedia and video into existing course structures. A very simple example being the embedding of Khan Academy⁵ videos or the ease with which anyone can embed a YouTube video.

ICT Infrastructure Limitations

Through the Digital Campus elearning certification course, lecturers are encouraged to introduce more variety into terms of course content and activities, especially to make use of open education resources, videos and other multimedia content. However the internet and network infrastructure within Ethiopia does not lend itself well to the reliable delivery of streamed video content over the internet, or of the downloading of large files generally. If teachers are to effectively utilise video resources in their courses, they need to have the confidence that their students will be able to access these reliably.

An example of the bandwidth limitation can be seen from the experience at Mekelle University. The University has a contract to receive a 20Mbps fiber optic internet connection, to supply internet connectivity for its 2,000 staff and 20,000 students. However, the actual bandwidth received (data taken from network monitoring software during February and March 2011) is closer to 2Mbps. To maintain even a reasonable level of service to all users, access is blocked to many video sharing and streaming sites, such as YouTube, amongst others.

The combined issues of limited access alongside the blocking of bandwidth heavy internet services vastly reduces the ability of lecturers to browse and search for suitable multimedia content they can use to enhance their courses. Several strategies are available to overcome these issues, all of which involve storing multimedia resources on a local server for delivery via the local intranet, reducing the load on the university internet connection.

1 <http://www.uah.es>

2 <http://www.aecid.es>

3 <http://digital-campus.org>

4 <http://www.mu.edu.et>

5 <http://www.khanacademy.org/>

Hosting Content Locally

A very quick and simple method for storing the content locally simply involves setting up a file sharing area on the local network to which everyone has access (either anonymous read-only access, or with a user account to enable write access too). The actual multimedia content can be copied from CD or DVD into the file share area. However, this method soon becomes unmanageable. As the amount of content grows, it becomes difficult to maintain structure. Content can only be identified by its filename rather than any metadata, since none of the content has any description, rating information or associated folksonomy tags. Browsing and searching for relevant content can be time consuming, navigating through a large file and directory structure.

Another issue with this method, especially for video content, is that video content is not streamed, the entire file must be downloaded to the users desktop or laptop computer before it can be played. For short video clips of a few minutes and up to around 10Mb in size, this generally isn't an issue, but longer videos, for example 45 to 60 minute video lectures, which may be several hundred Mb in size, can still be time consuming to move across even the local network. This is especially the case where lecturers are browsing for suitable content, they may only need to view a few minutes of video to identify whether the content is suitable.

Once the lecturer has found suitable content for their course, another question arises, should the multimedia file be embedded into their Moodle course, or simply linked out to the file share area? If the file is copied into Moodle, especially in courses where a lot of video content is used, this can begin to consume large amounts of disk space. Since the university lacks large amounts of disk space, such as Network Attached Storage (NAS), disk space is often at a premium. If a simple link is placed within the course, the lecturer needs to be sure that the file structure isn't changed.

Streamed Video Content

The natural solution to the limitations of using a simple file share area is to set up a local streaming server to host multimedia content. This is a more complex solution in that it requires more ICT support to set up and maintain, yet should result in a more effective and reliable method for delivering video content.

A wide range of video streaming server software is available, although almost all are proprietary software solutions. The Digital Campus programme focusses on using Open Source software wherever possible in order to minimise the costs for the universities and organisations we work with. Our requirements for the software solution necessary to stream video content were that it was:

- 1) open source, and would run on an open source operating system such as Debian or Ubuntu
- 2) available to download and run locally, rather than a remotely hosted solution
- 3) would accept a wide variety of common video formats, such as flash, MPEG and AVI
- 4) allows users to easily browse and search existing content
- 5) users are able to upload their own video content

The only software we found which matched all these requirements was Kaltura⁶, so we have begun to test this software with a view to implementing this within Mekelle University for the local streaming of multimedia content. On uploading video content, users are able to add descriptions and tags to the videos, making it easy for other users to search and browse.

Kaltura also offered an plugin module to allow users to browse, search and embed content directly from within the Moodle course management platform. Unfortunately we have experienced some issues with this plugin, as it only allows users to browse/search for video which they have uploaded

⁶ <http://www.kaltura.org>

under their own user account. With the current version of the plugin there no way to browse/search for videos across the entire Kaltura server.

To get around this issue we have begun to create, using the Kaltura API, a basic web application which will allow lecturers to search across all the videos uploaded to the server, as well as upload their own. This essentially creates a self hosted YouTube style video streaming service for the university. Lecturers (or students) can have anonymous access to browse all the video content and are provided with the HTML object embed code to be able to embed the video in the university Moodle server.

There are still other issues which we need to assess before we are ready to install Kaltura as a service within Mekelle University. Most of these issues relate to the server and disk space specification and capacity required to make the service reliable and stable. When videos are uploaded they need to be processed into a format which Kaltura can stream, any video conversion tends to be server processor intensive. Also we need to assess the capacity of the internal network infrastructure to ensure it is able to deliver a stable service, without impacting other network users.

Implementation

From our experiences, using a simple shared directory based service is not a maintainable solution for a large university, where staff and students need a reliable system for multimedia content delivery. Implementing a self-hosted video streaming service is, in our opinion, the best solution for a university to provide its students with access to educational video content, especially in an environment with restricted and sometimes unreliable internet access.