Summary Report on Media Servers

Current State, Possible Shared Services & Use Cases

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Executive Summary

Driven by an initial request by the Consortium for Open Learning (formerly Open University Consortium), BCcampus was asked to look into the possibilities of a "YouTube for BC educational materials." As part of this request, BCcampus has undertaken an investigation of the current state of media streaming technology in the province, with a focus primarily, but not exclusively, on video streaming. This research included calls with 20 institutions to discover the current technologies in place, the workflows that support video content, and where they saw this going in the future. The result is a set of high level use case and requirements for a "YouTube-like" service, but also a larger set of possible discussion points for shared services around video content infrastructure. These included the possibility of reduced costs through shared licensing, a BC Commons streaming server, an open source "front end" to existing streaming servers, as well as the need for a deeper discussion around the limitations of the Freedom of Information and Protection of Privacy Act (FIPPA) of British Columbia, the Patriot Act (USA) and 3rd party hosted services.

Background and Initial Problem Statements

Background

In April 2008, the Consortium for Open Learning asked BCcampus to work with consortium members to explore a set of potential instructional shared services, including:

- Elluminate web conferencing shared service

- Student file spaces for portfolios and artifacts ("digital locker")

- Media hosting services such as a "YouTube for BC instructors and students"

- Sandbox for experimental testing of instructional applications

BCcampus, through its support of instructional resource sharing in SOL*R and its support of the ITA E-PPRENTICE project, also identified an emerging need for infrastructure to support audio and video content online. Thus began an investigation into the problems to be addressed, possible solutions and the current state of affairs of audio and video streaming support in institutions around the province. This report is a summary of these findings and will hopefully offer a starting point for further discussions on potential shared services or approaches that can benefit all stakeholders.

Initial Problem Statement & Use Cases

Audio and video media content has rapidly become a major component of the online experience as well as the online learning experience. In addition to institutionally provisioned content, in line with broad movements towards participatory media and social software it is anticipated that there will be a great uptake in learner-generated content as a formal requirement for coursework. While

existing services such as YouTube and Blip.tv are already in widespread use by students for their personal needs, there is a large concern that, because of the implications of the Patriot Act, these US-based services may run afoul of BC's FIPPA legislation if used in the context of formal academic work. This has led to a request that BCcampus investigate possibilities for a "YouTube-like service for educational content in BC." By this we understand a system that would fulfill the following needs, as well as the High Level Use Cases outlined in Appendix 1:

- Reduce bandwidth demands of hosting large video collections

- Handle large numbers of connections to individual pieces of video

- Handle disk storage requirements for large video collections

- Provide a self-service way for students, faculty and staff to post and host video on the Internet

- Accommodate a wide variety of commercial codec formats for uploading video and stream in one standard, web accessible format

- Provide a way for users to embed video in a variety of other contexts

- The ability to restrict access to specific videos or collections

- Ideally, provide a way for users to easily re-use, re-mix and re-purpose video content

- Avoid potential privacy issues that 3rd party, US-based services may incur

(N.B. It is important to be clear that streaming servers are different than downloading media via HTTP - while progressively downloaded video formats like Quicktime, Flash and Windows Media formats can make it appear as if a video is being "streamed," in fact the entire file is being downloaded to the local users machine. Not only does this mean a *copy* of the file is now on that users local hard drive, this approach is not able to adjust dynamically to different bandwidth requirements or download volumes, nor is it capable of live streaming content.)

As part of our initial investigation BCcampus also identified a number of existing candidates for such a service, either existing services that did not run afoul of FIPPA concerns or else open source (or low-cost) alternatives that could be hosted in the province. A brief summary of these services is included in Appendix 2 (note: some are clearly US services but are listed because of their widespread use and support for many of the use cases.)

Summary of Phone Interviews

It became clear that the use case summarized as "a YouTube for educational content in BC" actually contains two distinct components - a media encoding and streaming service, and some sort of web-application to manage the workflow for submitting videos and to assist in finding and using videos. While the latter is something that many campuses do not necessarily have, the former, the media server itself, is reasonably mature technology that has been in use. In order to further clarify the status of media streaming at institutions around the entire province, and also to clarify the ways in which these were currently being used, BCcampus undertook a series of phone interviews in November and December, 2009. We prefaced these interviews by emailing out the following high level questions as discussion points:

1. Do you currently provide any video streaming infrastructure or services?

2. If so, who is able to post video? Can they upload video themselves or is it facilitated by support staff?

3. What types of videos do you support? For instruction? Institutional content (marketing, communications, student services)? Student-generated content?

4. Is the service self-hosted or a third-party service?

    1. If self-hosted, which software do you use?

    2. If a third party, which one?

    3. If a US-based third party, how have you addressed FIPPA concerns about student data and the US Patriot Act?

5. If you provide video hosting how do you manage copyright clearance?

    1. Do you provide a library of existing licensed materials for re-use?

6. What future needs can you see for serving video content, and what plans are you making to deal with these?

7. Would you be interested in a provincial "shared service" to support video hosting? If so, describe ideally how this service should work.

Current Status of Streaming Servers in BC

The phone interviews revealed that the following streaming media servers were already in place across BC post-secondary institutions (Please note BCcampus did try to contact all schools but went ahead with responses from 20)

Current Media Server Adoptions in BC Post Secondary

Media Server	Number of Instances in BC Post-Secondary
Flash Media Server	5
Windows Media Server	4
QuickTime Streaming Server / Darwin	3
Other	2 (Helix, IBM)
None / Under Investigation	6

Lack of Self-Service Options

In almost all of these cases of locally hosted media servers, the workflow to upload and encode media was largely manual and almost exclusively mediated by educational technology or other support staff. There were no fully web-based self-serve options in place (a few indicated that select users could access the media server via the local area network)

Exclusive Focus on Instructor and Institutional Content

In the vast majority of these cases, these servers were being used to serve instructor-provisioned or institutionally-provisioned content (e.g. marketing & communications materials). In the one or two cases where student content was hosted on these servers, it was very much mediated through the instructor and/or staff upload process.

While in some cases institutions have grown a cache of content that might be reusable by others in their institution, this did not seem like a primary motivation for providing the service. Very few institutions had a pool of pre-licensed copyrighted materials for use by instructors and students other than some materials licensed on an ad-hoc basis from textbook publishers.

Use of 3rd Party Services

In addition to these locally hosted streaming servers, a number of institutions are posting content on YouTube, Blip.tv and iTunesU. In almost all of these cases this is either institutionally-provisioned content, or a process mediated by some central unit of the institution. In a few cases it was understood that as long as instructors were not requiring students to post content they were using such internal services to host their own materials.

Most institutions interviewed indicated that there were indeed concerns about whether 3rd party US-based services ran afoul of FIPPA rules, and there was broad acknowledgment that further investigation at the provincial level as to the realities of these concerns as well as possible legal workarounds would be extremely welcome.

Additional Common Concerns

Copyright violations and inappropriate content were the number one concern voiced about the possibility of a self-service system. In addition, in regard to any potential shared service, a number of people indicated they might be interested only if the system supported authentication with local systems, the ability to impose locally-controlled authorization, a locally-branded front-end and "tight" integration with on-campus Learning Management Systems (LMS.)

Options Warranting Further Discussion

Based on these initial phone interviews, the following set of options emerged as areas for possible collaboration that seemed to warrant additional discussion:

Legal Opinion on Workarounds to Patriot Act/FIPPA concerns

All participants agreed that before any work began to create a service motivated primarily by privacy concerns, that legal opinion be sought at the provincial level as to any possible workarounds (e.g. informed consent) to using US-based 3rd party services. While the higher education use case does present some special concerns that large commercial services may not address, it was universally acknowledged that the students already knew about and used these services, and that the technical quality of the service is likely far higher than anything that could be produced locally. So, the commercial option should be exhausted before creating a parallel service. Participants universally called for clarity and some BCcampus-led investigation and/or meeting on this in Spring 2010.

Straight Licensing Deal

Given the commonality of software used to stream media, one obvious entree into the shared services arena is a straightforward aggregated license deal. All participants expressed interest in any cost savings that might be generated that way.

CDN - Content Distribution Network

The idea of either a provincial content distribution network, or a provincial deal with a large CDN supplier like Akaimi (http://www.akamai.com) was proposed by Douglas College and seemed of medium-high interest to a number of other participants when mentioned. Part of the attractiveness was that such an approach leaves the campus to act autonomously but to harness the network/ consortium for a useful goal. It seems likely, though, that this kind of work is maybe best left to the network providers (BCNet, PLNet) or at the very least they should be able to speak to the extent to which it is a concern in their domains of practice.

One thing that this aspect of the investigation revealed was that there were widely varying concerns about the demands on local bandwidth placed by audio and video content. This was largely a factor of the institution's geographic location (which can effect bandwidth availability), their predominant delivery model (distance learning, blended/hybrid or fully f2f models) and the extent to which video was already embedded in the instructional process. In addition, there is still a large disparity in the network connectivity of end users - lower mainland/urban schools largely did not identify bandwidth as a factor for students while more remotely located schools often identified this as a major concern for end users, something that might be ameliorated both by a CDN and by streaming server technology.

"Front End"

There are 2 components to a "YouTube-like" service - the media encoding/streaming server, and the web application that handles workflow, authorization etc. While the majority of schools already had a media streaming server of some variety in place, None of them had a way to handle student generated content or even faculty content in a self-serve way that scaled. All expressed mid-to-high interest in the idea of an open source/free/provincially-licensed front end application that could facilitate this in front of whichever streaming server was available. To the extent to which this could coincide with any local "community / content / collaboration" software in use for communities of practice on campuses, this would be fortuitous. Almost all expressed grave concerns over copyright liability in a self-serve model.

"Central" Server/Service

There was lukewarm interest in a centrally provisioned streaming server for student content; while some felt it could be useful, issues of copyright, authentication, branding and archiving were all raised as serious reservations.

BC Commons Media Server

There was mid-to-high interest in being able to get and share BC Commons licensed videos from a streaming server hosted by BCcampus, possibly in conjunction with SOL*R.

Appendix 1: High Level Use Cases and Requirements

Use Cases by Lead Actor

Students

- Student wants to upload and link to a video clip for class discussion or other class use?
- Instructor asks students to submit video assignment for class
- Students want to jointly develop/edit video-based projects

Instructors

- Instructor (or with staff assistance) records lecture and uploads for sharing with his class
- Sub-case: Instructor records lecture and uploads for sharing with the world
- Sub-case: Instructor records lecture, uploads and wants to sync video and audio with her PowerPoint lecture
- Instructor wants to upload a clip to use in their class blog or LMS-based course

Institutional Actors (e.g. Marketing/Communications Dept., Conference Services, Library)

- Conference Presentation Streamed and archived
- Communications, Marketing or other administrative group wants to publish institutional video
- Library wants to be able to share licensed video with ONLY select users and count the amount of usage

Additional High Level Requirements

Must-Haves

1. The system must support easy self-service uploading of video files in a number of different common codec formats via a web-interface

2. The system must support the ability for content owners to restrict access to who can view the clip.

3. Access control in the system must be easily derived from existing class list sources (e.g. SIS)

4. The front page of the site must be configurable and be able to branded by the institution

5. The system must be able to display the number of views of a specific video in place

6. The system must provide embed code which can be copied and pasted into other web locations to provide embedding of videos in other contexts

   - specifically, the system must be able to provide embeddable content that works in all of the major LMS in the province (WebCT, D2L, Moodle)

7. The system must support threaded comments on individual videos

Nice-to-Haves

1. The system could be able to provide a live stream

2. The system could provide a way to record video directly and easily from a built in webcam in an end users' computer

3. The system could support the ability for content owners to further specify who can comment, annotate or remix a clip

4. The system could support the ability to easily create derivative copies and remixes

5. The system should support playlist creation and auto-play

6. The system could support voting on videos

7. The system should support synchronization of recorded videos and PowerPoint slides for lecture archiving

Appendix 2: Initial List of Possible Candidates

This list was initially circulated to the BC Open Learning Consortium group in November, 2009.

YouTube	http://www.youtube.com	• User-driven video hosting service • API • No formal 'groups' • Advertising ridden • US hosted • Limits video length to under 30 minutes	No cost
Blip.tv	http://blip.tv/	• User-driven video hosting service • API • No formal 'groups' • US hosted • Have done one-off sites (i.e. MIT TechTV)	No cost for public service Pro Account $9/month for extra transcoding features
Video.ca	http://www.video.ca	• Canadian-based YouTube-clone service • Part of the http://www.dailypixel.ca/ network of sites	Unknown

Kaltura	http://corp.kaltura.com/	• Open source video serving platform • Includes online video editing/annotation tool • Off the shelf integration with Drupal, Wordpress and MediaWiki • Was used in the WikiEducator project • Kaltura is the support company built up around the software	Potentially "free" but likely done through the support company integrators
CC Host	http://ccmixter.org	• Open source • "Web-based System Supporting Remixing and Collaboration on Media" • Powers http://ccmixter.org/	"Free"
OpenCast / Matterhorn	http://www.opencastproject.org/project/matterhorn	• US-initiated (but not exclusive) consortia "working together to explore, define, and document podcasting best practices and technologies. • "Matterhorn" is code name for not even Alpha-level project	N/A
InSinc	http://www.insinc.com/	• Canadian-based • Commercial video serving/webcasting software • Not entirely clear that it is an "Off the Shelf" piece of software • List BC Ministry of Education as a customer - http://www.insinc.com/clients/case-study_bc-ministry-of-education.php	Unknown

Netro	http://netro.ca/	• Canadian-based • Commercial video serving/ webcasting service • List "YouTube-style sites" as one of the services they provide, offer http:// www.exxv.com/ as an example	Unknown; there is a quote calculator on the site to get per user or per GB estimates for streaming service
Iris Education	http:// www.iriseducation.org	• Seattle-based video streaming service provider • Work specifically with the education sector • Very much about streaming centrally (i.e. library) provisioned copyright cleared materials, NOT self-service student video	Unknown