Why did Pomona College build Video47?

For a number of years Pomona College has used a proprietary video-on-demand product to deliver academic video content over the web. After some evaluation, we came to the conclusion that it could do a better job of delivering academic content with an in-house system built around open-source technologies. We were in search of a solution with some of the following characteristics:

- Had to be easier to use for students and faculty
- More flexible systems administration
- Ability to view video over wireless
- Did not want download special plug-ins
- Ability for faculty to self-manage playlists
- LDAP Authentication
- Better video quality
- Larger file sizes / conserve disk space
- Ability to utilize multiple video servers and/or players
- Eliminate the need for duplicate media
- Ability to use or convert legacy video content
- Must have a fast forward and jump to function
- Needed meta-data and searchable video repository
- Content to be accessed inside Sakai and by cross-registered students
- Needed quick encode workflow add new video content
- Ability to handle multiple user types
- Wanted to use off-the-shelf hardware

What did we come up with and how?

During the summer of 2009 in an effort to figure out what features were need as well as those that were wished for we held a few sessions where the faculty and staff were able to provide input and give feedback on the project. These meetings were held during the design, prototype, and launch phases.

- Better workflow for encoding content
- Automatic conversion for legacy content
- Asset management system with monolithic video repository (no duplicate media)
- Controlled access through LDAP/AD and Sakai
- Time expired playlist access and content
- Ability to embed into our Sakai LMS
- Self service playlist creation for faculty
- Ability to import course data from Jenzabar (our SIS) frequently
- Option to implement various media players on the user end / no funky plug-ins
- Option to choose multiple streaming technologies (in the event flv goes bad)
- Ability to implement multiple streaming servers and multiple media
- Design a modified Dublin Core metadata for video assets
- Create a faster media encode and transcoding process, more efficient student labor
- Better fast-forward, timeline scrub, and a bookmark capability.

Hardware Specifications

Our current configuration uses one server, however the use of multiple physical servers is possible. Off-the-shelf hardware was used for all components.

- IBM X3650 Single Quad Core
- 8 GB memory
- Disk Space: 2 x 2 terabyte raid for media

The video encode stations use four retired 1.4 GHz Dual Core Mac Minis equipped with an Elgato USB video capture device. Additionally we use several 2 terabyte external disks to archive pre-transcode media for backup.

Web Interface Login Account Types

The web interface is divided into four categories of logons or views.

- Sakai View: A course playlist is embedded within Sakai using the Sakai web tool. Student authentication is accomplished through Sakai against Claremont consortium LDAP servers. When a playlist is requested within Sakai a secure token is exchanged allowing access to video content. For the student the content has an expiration date, can not be viewed outside of Sakai, and is not downloadable. Secure streaming is possible with a Flowplayer and Wowza server configuration.

- Student Stand Alone View: Pomona College students can use their campus login to view course playlists. Authentication is against the campus LDAP server. While this login method is not normally used it was designed as an alternative method of viewing.

- Faculty Administrator View: Pomona College faculty can build playlists for their current semester courses. Additionally, it is possible to clone playlists from previous semesters. Faculty can not see other faculty member playlists. However, faculty have full access to the entire media database and the ability to add any of its content to their course playlists. Faculty have read access to media meta-data and are not able to add media to the system. Faculty are also able to see the Sakai and student views above. Faculty data is loaded into the system with their courses each semester from Jordanel. Faculty are authenticated using campus LDAP.

- Video47 Administrator: This account manages the video assets and their associated meta-data. The account also has full control over all playlist administration functions such as add, modify, delete, and clone. Administrators are kept in a configuration file on the Video47 server but authenticated using campus LDAP.

Screen shots available on the other poster:

Outcomes

- Support calls became almost non-existent
- Verified usage over wireless networks both on and off campus
- Increase in faculty playlists by about 150% (Fall ’09 semester 194 courses had playlists)
- Increased media in asset library by about 50% (989 in Summer ’09 to 1430 Spring ’10)
- Fall ’09 14% of Pomona College courses used the system up from 7%.
- Saved about 2/3 in disk space, a typical 1GB move is now 300 mb with better quality
- Quickier media encode turnaround time, went from one encode station to four.
- No more buggy plug-ins or proprietary software developers to deal with
- Increased media in asset library by about 50% (989 in Summer ’09 to 1430 Spring ’10)
- Faculty have gained control over their video assets and are able to grow without fear
- Least number of staff and student worker hours, we can get other stuff done.
- Demonstrated that it is possible to “plug together” a lot of different technologies easily
- Unexpectedly, faculty began using Video47 in class while lecturing.

How long did it take and what did it cost?

The idea for Video47 was hatched in the Fall of 2009. Programming and systems development started in the Spring of 2010 and finished in the Summer of 2009. Legacy media conversion and a live production server was completed by August of 2009. In September, 2009 we were officially in production. Our legacy VOD system was mothballed in October, 2009.

The project had one lead person who designed most of the systems architecture and did the programming. Student labor was involved in the meta-data input and media translation processes for about 100 hours. Some aspects of the project extended into other areas of departmental and institutional expertise and are therefore hard to quantify.

We purchased about $4,000 in new hardware. We decided to use Redhat Linux and the Wowza media server which both required a license because they worked well together. Alternatively, it is possible to use CentOS and Radis configuration which we did while prototyping.

What about copyright?

Please see http://copyright.claremont.edu/ for our copyright policy.
Future Enhancements

The project will continue to evolve and we will most likely add new features. Here are some that have been requested.

- Additional ways to search meta-data
- Some sort of integration with the IMDb
- Ability for faculty to create “virtual libraries” or “meta-collections”
- Folksonomy or some kind of tagging system
- Dual screen playback - the “Rick Blackwood” feature
- Ability to better handle various aspect ratios
- Digital stream for specialized faculty meta-data input / QC system
- More descriptive statistics
- Faster than real-time encoding

Why the number 47?

In 1964, Professor of Mathematics Donald Bentley proved that all numbers are equal to 47. Since then, Sagehens in search of 47 trivia, have found that this quintessential random number turns up in the most unlikely places.

- Pomona College is located off the San Bernardino Freeway. The sign reads: Claremont Colleges Next Right, Exit 47.
- Tolstoy’s novel The Kreutzer Sonata is named after Beethoven’s Opus 47.
- The New Testament credits Jesus with 47 miracles.
- The Declaration of Independence consists of 47 sentences.
- Pancho Villa was killed by a barrage of 47 bullets.
- Cesar proclaimed “veni, vidi, vici” in 47 B.C.
- The tropics of Cancer and Capricorn are located 47 degrees apart.
- If all this 47 trivia upsets your stomach, you’ll be glad to know that Rolaids absorbs 47 times its weight in excess acid.