Opencast Matterhorn 1.1: Reaching New Heights

Christopher A. Brooks, Markus Ketterl, Adam Hochman, Josh Holtzman, Judy Stern, Tobias Wunden, Kristofor Amundson, Greg Logan, Kenneth Lui, Adam McKenzie, Denis Meyer, Markus Moormann, Matjaz Rihtar, Ruediger Rolf, Nejc Skofic, Micah Sutton, Ruben Perez Vazquez, and Benjamin Wulff

University of Saskatchewan, Universität Osnabrück, University of California at Berkeley, Eidgenössische Technische Hochschule Zürich, Jožef Stefan Institute, University of Nebraska-Lincoln, University of Vigo

What is Matterhorn?

Matterhorn is a free, open-source, enterprise-ready platform that supports the management of educational audio and video content. Institutions use Matterhorn to produce automated lecture recordings, manage existing video, serve designated distribution channels, and provide user interfaces to engage students with content.

The User Story

Mary, Administrator

Mary runs the podcast program for the campus, and works directly with the instructors to schedule and manage recording and distribution of the course lectures. She is most interested in insuring that the podcasts are published are

Schedule a class to be recorded

Mary enters course information into the Matterhorn admin interface, schedules the course to be automatically recorded on specific days and times of the week, and the channel to which they will be published.

Upload Recording

Some courses are not in podcast-capable rooms, and so these classes will be recorded by a camera operator. Mary schedules these courses into the system, and then later uploads the recording for processing.

Hold for review

Once Mary enters a video into the system by capture or schedule the processing begins, and the recording heads straight to distribution. Mary could choose to have the video processed but held for her to review before continuing to distribution. This allows her to check for quality, copyright, closed captioning, and other concerns before the recording goes public.

Media Processing

Once ingested into the system, the file undergoes several processing functions that enrich, brand, and make the media more discoverable and accessible.

Salvador, Learner

Salvador is a hard working student who attends all classes. Courses are not taught in his native language, however, and so it's difficult for him to hear and understand everything the instructor says, and especially difficult to take reliable notes. He relies heavily on lecture recordings.

Annalise, Instructor

Annalise has found that lecture recordings have been very helpful to her students in the past, and wants to make these as accessible to the students as possible. She is very interested in including her lecture recordings in the most relevant contexts for her students.

Slide Thumbnail Navigation

Salvador finds it helpful to listen to relevant portions of a lecture while reviewing other materials on the same topic, such as readings or his notes; slide thumbnails are helpful to find the section he's looking for.

Embed

Annalise can embed a video within other content, such as within an LMS, blog post, or web page, so that a recording can be viewed within the context of other learning materials and activities.

In-Video Text Search

Salvador can also search by keywords for parts of the lecture; keywords are automatically derived from video OCR and allow Salvador to jump right to the relevant part of the recording.

Feeds

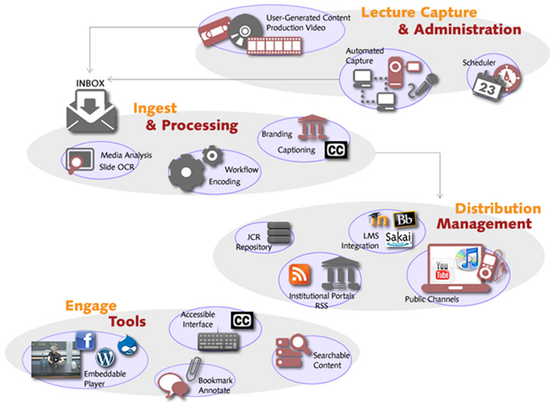
By subscribing to the course's RSS feed, Annalise's recordings for a given course can be included within the learning management system making them more readily accessible by students.

A Whole Classroom Experience

Matterhorn offers the ability to capture multiple video and document streams, capturing the full lecture as Annalise gives it. Salvador finds the ability to change the focus between the video streams full screen on the fly invaluable.

Architecture

Matterhorn is extensible, scalable, and runs on a variety of different hardware platforms and configurations. Several commercial and support vendors exist and provide portions of the Matterhorn lecture capture tool chain, allowing institutions to choose the level of support that best fits their needs.



Matterhorn is service-oriented where individual services (shown above) communicate using REST where possible. The system runs inside of the Java OSGi container environment, and a number of media frameworks are using including ffmpeg and gstreamer. Support exists for single sign on through CAS and centralized authentication through LDAP.

All activity within Matterhorn is part of a workflow, and workflows are declarative and easy to expand. Connecting Matterhorn to institution systems or research systems often requires minimal or no source code changes!

Opencast Matterhorn 1.1 Video Playback Screenshot (engage)

What can Matterhorn do for:

Students:

- enable anytime learning, letting students choose when and how they want to consume lecture content
- encourage thought and participation in the classroom instead of rote transcription
- connect students at a distance to those in the classroom, removing barriers of geographic location
- help provide an environment for purposeful reflection, where students reconsider lectures before asking questions

Instructors:

- create copies of lectures with no interaction from instructors, thus enhancing the teaching and learning process without increasing demands on instructor time
- give opportunities for pedagogical reflection and review of teaching, allowing instructors to consider their methods of lecturing
- reduce demands on instructors to provide material to students who missed it

Institutions:

- strengthens the robustness of the academic mission by providing alternative delivery forms in case of disaster, pandemic, or other emergency
- allows IT professionals to leverage existing systems to enable lecture capture on physical, virtual, or cloud environments
- provides opportunity for deeper integration of lecture support systems within the academic environment

Researchers:

- allows media researchers to test innovations in a broadly used multimedia environment while focusing only on the aspect of the system that is novel to them
- encourages the movement of research results out of the lab and into wide-scale production
- enables non-technical researchers such as those in the social sciences, humanities, and arts, to carry out media-related inquiry

Matterhorn Enables Multimedia E-Learning Research!

Some of the research results based on Matterhorn technology:

C. A. Brooks, C. Demmans Epp, G. Logan, and J. Greer. The Who, What, When, and Why of Lecture Capture. In 1st International Conference on Learning Analytics and Knowledge 2011 (LAK'11), 2010.

M. Ketterl, J. Emden, and O. Vornberger. Using social navigation for multimedia content suggestion. In Proceedings of the 2010 IEEE Fourth International Conference on Semantic Computing, ICSC '10, pages 448-449, Washington, DC, USA, 2010. IEEE Computer Society.

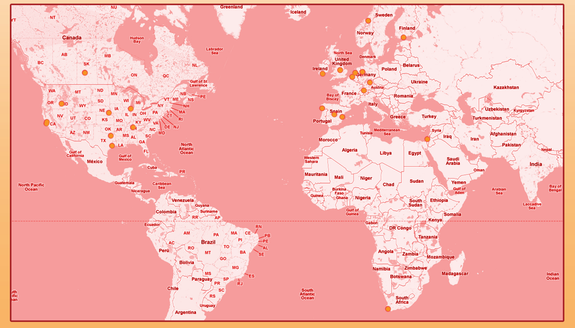
M. Ketterl, R. Mertens, and O. Vornberger. Bringing web 2.0 to web lectures. International Journal of Interactive Technology and Smart Education, 6(2):82-96, 2009.

M. Ketterl, O. A. Schulte, and A. Hochman. Opencast matterhorn: A community-driven open source software project for producing, managing, and distributing academic video. Interact. Techn. Smart Edu., 7(3):168-180, 2010.

Come ask us questions! Mailing list at community@opencastproject.org or development IRC at #opencast on irc.freenode.net.

Opencast is a community of individuals, higher education institutions and organizations working together to explore, develop, define and document best practices and technologies for management of audiovisual content in academia. The community shares experiences with technologies and practices as well as identifies interesting future approaches and requirements. The community is open to anyone to join and participate in, with most of the participation happens through build projects (such as Matterhorn) and the community mailing list (community@opencastproject.org).

Opencast was founded in 2006 by thirteen higher education institutions to build open source solutions for academic video management. Together, with the help of funding from the Andrew W. Mellon and the William and Flora Hewlett Foundations, the Opencast project has grown Matterhorn from a small incubator project into an enterprise-strength solution used at more than 25 institutes of higher learning world wide.



Opencast, and the Matterhorn project, are sponsored by commercial partners who offer consulting, service, and hardware support for Opencast platforms:

Entwine, epiphan SYSTEMS INC., NCast™ TAKE STREAMING FURTHER