

# Videotorium – video sharing for Hungarian research and education

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## Abstract

In recent years – to take advantage on successful video sharing portal concepts – many research network organizations, universities and research institutions had created their own video sharing portals in support of research and higher education. These portals are not only helping direct teaching and distance learning, but they also provide a great opportunity to give more recognition and a better understanding of the work of research and education community. To serve research and science effectively, these portals must employ special “weaponry” to meet scientific requirements. Videotorium uses special services and innovative user interfaces to allow user exploitation of web technology in sharing multimedia content for a wide audience. The portal allows slide to video synchronization by user to provide maximum viewer experience. In addition, Videotorium features a special metadata model and multi language thesauruses in order to achieve the best possible retrievability of content to establish a sustainable research and educational video repository. Standard based metadata aggregation features allow metadata exchange with other content aggregators such as national and international repositories.

**Keywords:** multimedia, video sharing, media repository, streaming, metadata, OAI-PMH, Shibboleth AAI, eduID, OCR, thesaurus

## Introduction

Recording and web publishing of videos at [NIIIF/HUNGARNET](#) started back in 2003 when our yearly conference was first recorded and webcasted. Evidently, as know-how emerged and more and more recorded materials gathered from scientific conferences and events, there was a public demand to publish these in a web multimedia repository: we launched our “Video on Demand” (VoD) web archive built on a simple web interface and Windows Media. The repository had been slightly improved with years (better backend database, flash playback, etc.) to improve browser compatibility and easy of use, but could not fulfill the need for third-party sharing feature, sophisticated detailed metadata description and modern navigation/retrieval practices.

We started designing and implementing our new portal called “[Videotorium](#)” in 2009 with keeping an eye on the following requirements:

- Upload feature up to HD quality,
- Presentation synchronization to video by user,
- Metadata capabilities to meet scientific retrieval requirements,
- Full text indexation of uploaded documents and slides to support search engine,
- Basic community features (commenting, rating, embedding, sharing, etc.),
- Metadata aggregation features (OAI-PMH),
- Support of Shibboleth AAI,
- Live broadcast through the portal.



## Architecture

Videotorium is built mostly on open source software, such as Apache/PHP, Lighttpd, MySQL database, Memcached, ffmpeg, mplayer, OpenOffice, etc. The architecture is constructed from fairly independent components, which concept enables us to deploy any of these in any instances on multiple pieces of hardware.

The presentation will describe architectural components and their connections such as front-end web server, streaming server, storage, database, converter node and others.

## Metadata capabilities

Videotorium metadata structure is a good compromise between possibility of professional media content description meeting scientific requirements and limited metadata knowledge of non-specialist users (i.e. non-librarian). The metadata model itself is built on [Europeana Semantic Elements \(ESE\)](#), but includes a considerable extension by introducing three levels of metadata description:

- Basic metadata (partly mandatory fields): recording title(s), subtitle(s), detailed description, time of recording, list of contributors (names, jobs and organizations) and their roles, contributor key pictures, recording genre, technical metadata, etc.
- Science field classification (optional): based on Ortelius thesaurus once developed by the European Union for research application classification. Videotorium is using a dual language (Hungarian and English) version of Ortelius.
- Content description (optional): using free tags and/or the well-known [Library of Congress Subject Heading \(LCSH\)](#) thesaurus complemented by a Hungarian translation making it dual language. LCSH features ~180,000 keywords and ~31,000 relations between them.

The metadata model is using an approach, where a dual language description is optionally possible for the user: original language (language of the recording) and English. This not only supported by metadata fields, but as well as by multi language thesauruses. This would allow finding non-English recordings using English keywords.

## Media publishing process

The process of publishing a recording starts with upload of media file(s) and other documents:

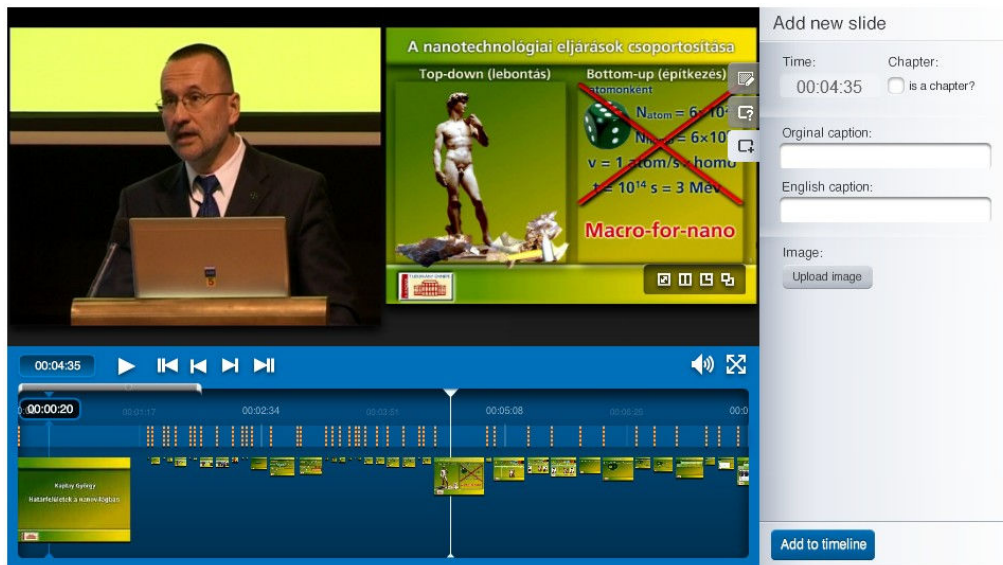
1. Upload files:
  - a. Media file(s): original media file and further language versions (e.g. with translated audio track).
  - b. Upload of presentation to be synchronized to media.
  - c. Upload attached documents, images, etc.
2. Visual editing
3. Describe metadata (see previous section).
4. Set publishing options.

In step 1, after successfully uploading media file(s) a background conversation process takes place based on open source *ffmpeg*. Depending on the resolution/quality of the original media file(s) different H.264/AAC surrogates are created (lower and high quality). In addition, an audio only version is prepared and index thumbnails are also extracted from video. The index

thumbnails are also offered as contributor key images, so other users can easily identify the particular contributor record to reuse with other recordings.

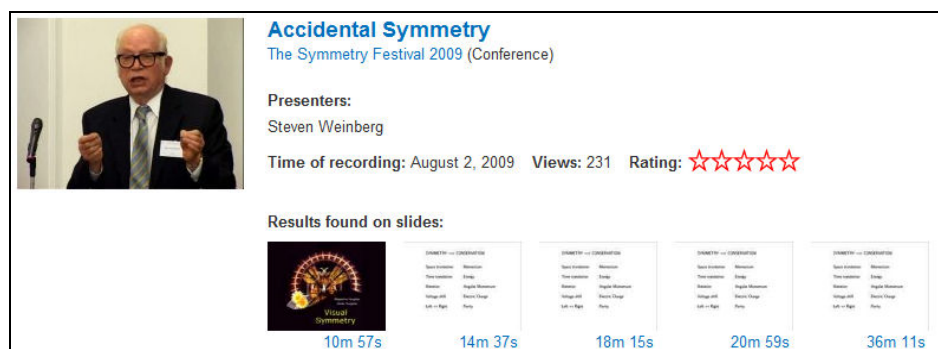
The uploaded presentation files are automatically converted to still images and thumbnails and the content is full text indexed to support search engine. The conversion job is done by a number of applications such as OpenOffice, Microsoft Office, Ghostscript, etc., the formats supported as presentation are PPT/PPTX, ODP, SXI and PDF.

As step 2, Videotorium provides an intuitive flash application to manually synchronize slides to media by easily dropping them on the video timeline. The application also allows adding slide titles, uploading still images as further slides and defining slides with caption.



1. Figure Videotorium editor application to manage slides of a recording

As a supporting feature, an automatic slide Optical Character Recognition (OCR) subsystem has been developed to allow optical recognition of uploaded still image slide content. Thus, the slide content becomes searchable and allows viewer to jump to specific slides in media (see screenshot). The Videotorium OCR system is based on *cuneiform* open source OCR framework. This also helped us to make the previously (VoD service) captured 45,000 bitmap slides searchable.



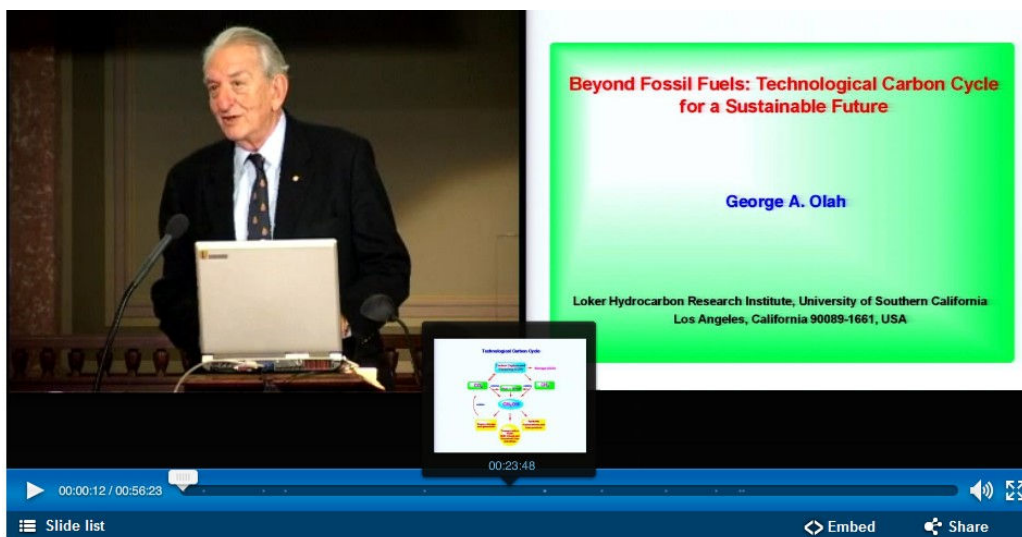
2. Figure Search result list showing slide hits based on OCR indexing

Adding metadata to recording (step 3) detailed in previous section. This process is backed by intuitive user interfaces to require the least effort from the user.

As a closing step before publication (4), the user must define a set of attributes such as authorization information, whether the recording is downloadable or not, metadata shareable to external sites or not, etc.

### The portal

The portal follows a structure similar to most video sharing portals. The navigation is possible using events/channels, science fields (categories), featured recordings, etc. The media is played back using a specialized flash player showing resizable video/slide areas and providing features such as full screen, media embed/share, slidelist, etc. Recordings can be rated, commented and added to personal collections.



### 3. Figure Videotorium flash player

The media is serviced by [Wowza Media Server](#), which allows flexible provisioning at good performance. RTMP streaming is preferred in the first place, but fallback to HTTP tunneled RTMP is also supported for strictly firewalled/proxied networks.

### Authentication

The authentication/authorization behind Videotorium supports both Shibboleth AAI (branded as [eduID](#) in Hungary) and “legacy” user/password. As an advantage to eduID authenticated users that they can immediately start uploading and sharing content, while user/password registered users must wait for a manual acknowledgement process. All static file requests (download of media files, slides, attached documents, etc.) are serviced through Lighttpd server after checking authorization information through an internal authentication service. The streaming server is also integrated with the authentication scheme used, allowing a good security control over media access. The presentation will further detail the integration of AAI with the portal and the streaming server.

### Metadata aggregation features

Videotorium intends to become a local research and higher-education multimedia aggregator by harvesting organizational repositories using the OAI-PMH protocol. Videotorium DC is specified that would be a common language for provisioning metadata towards Videotorium. The portal will be also capable of pushing metadata to other – higher level or international – aggregators. OAI-PMH was preferred in the first place as Videotorium intends to be compatible with public collection repositories such as library archives, Europeana, EUScreen, etc.

### **Live broadcast through the portal**

Live broadcast using a number of live encoders by the user is also possible through the portal, which will be described in the presentation in more details

### **Further information**

<http://videotorium.hu/>

<http://www.niif.hu/>

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