



Specification of Multimedia Services solution for University of Ljubljana

Overview

This document provides the specification of Multimedia Services solution for University of Ljubljana, as a part of public procurement procedure, to select a vendor for an integrated lecture capture solution (ILCS) as a service in the cloud offering recording, storage and publishing of videos of lectures in classrooms, lecturer and student recorded video content.

Content shall include the lecturer's verbal presentation, any content displayed or processed by the instructor computer and peripheral devices in or out of the classroom with minimal attention by the lecturer.

The solution must combine lecture recording, upload, management and storage of digital assets and should provide easy accessibility of digital assets through a Learning Management System and standalone web portal as part of proposed solution.

The digital assets should be accessible on different devices (desktops, laptops, mobile and companion devices such as smart phones, iPads, Tablets) and with different operating systems (Windows, iOS, Android, Linux) via easy-to-use and intuitive user interfaces.

The proposed solution must meet the functional and technical requirements stated in this specification.

Vendors are requested to propose training, solution deployment and integration services and customer support.

Technical requirements

This document contains technical requirements for deployment of the integrated lecture capture solution for University of Ljubljana.

The proposed solution should offer lecture recording, video repository with portal, system management and APIs for integration with other learning applications and administrative information systems.

Proposed solutions must demonstrate simple and intuitive user interfaces and have online user instructions and help. Provider must ensure that the offered solution supports the functionality and corresponds to the given technical requirements of this specification.

During the bid evaluation process, the client may ask the provider to demonstrate the proposed solution in order to make sure that the solution complies with the requirements in the specification.

Video content management, presentation and accessibility

The multimedia repository is intended for storing, serving and accessing / delivering multimedia learning materials, with the emphasis on video learning materials, created or used by teachers and associates at University of Ljubljana (UL).

During the epidemiological Covid-19 situation, much of the study process took place online. Video recordings, videoconferencing or live video broadcasts were largely used as a medium for delivering the study content. Remote lectures and various laboratory experiments were recorded, existing videos were used for additional explanation of the material, and in some cases videos were also created as a result of student project or seminar work. The use of video educational materials remained an important part of the pedagogical process even when the epidemic was over.

The ultimate goal to be achieved is to enable any UL higher education teacher to upload various videos for the pedagogical process, with as few restrictions on available space as possible. The pilot implementations of selected multimedia solutions at UL are one important step in this direction.

The MMR should serve as unified, private, secure and **structured storage of video educational assets**. Each video must have the possibility of adding descriptive/meta data, defining the video in more detail and making it easier to search or browse the repository.

The MMR should enable **management of access rights to video assets**, at the level of an individual user/student, a group of students (eg. a subject, study program or UL member/faculty), or public access. This means that the repository will need to be linked to the administrative student information systems (SIS) of UL members/faculties. During the pilot implementation, the possibilities of this integration will be analysed and specified for the SIS providers.

The repository should enable delivery of stored materials to mobile and desktop clients. It should provide transcoding capabilities into formats suitable for serving through different terminals and different broadband speeds.

Last but not least, video materials shall be accessed by students via various interfaces. They shall be accessed through LMS (in the case of UL, it is Moodle, in one case Canvas), through video portal native client interface (that may be a part or module of the proposed solution)

and in selected cases, videos may be embedded in websites. These features should also be the part of the solution.

As already mentioned, the MMR shall include a video portal on which the educational assets are accessible to students, again, based on the level of their access rights.

It is important, that the MMR is tightly connected or integrated as a part of the automatic lecture capture service that is presented in the next chapter.

Proposed solution shall contain multimedia repository, video content management and web based video portal with the following features:

1. Multimedia content upload:

- System shall provide easy to use and intuitive user interface enabling users to manually upload multimedia files in the scope of their roles and permission;
 - User can select target multimedia asset container, e.g. folder,
 - System shall support the following file types and formats: MP4, Fragmented MP4, MOV, AVI, ASF, MKV, FLV, WEBM;
 - System shall support video encoding: AV1, VP9, VP8, H.264, H.265/HEVC, VC1, and audio encoding: AAC, ALAC, FLAC, AC3, Opus, WMA9, PCM
 - System shall not limit the file size
 - System shall enable user to manually create multimedia content by combining pre-recorded video, audio and presentation files into one lecture; user may define timeline manually.
- System shall enable automated upload of recordings from Microsoft Teams and Zoom videoconferencing systems (note that Teams and Zoom at UL both enable SSO using Microsoft Entra as identity provider).
- Upload form Zoom shall enable:
 - Automated import can be configured for all user's recordings or can be limited only to selected users
 - Recordings are uploaded to user's personal folder when user has account on videoconferencing system and ILCS; when user doesn't have account on ILCS, recordings may be uploaded to ILCS and marked with user unique identifier for subsequent delivery if user gets an account on ILCS later on.
- Integration with MS Teams shall have the following features:
 - ILCS is embedded into Teams environment in a way that enables user to access content in multimedia repository together with main ILCS features;
 - Search function in Teams and O365 shall include full search over ILCS residing content.
 - ILCS content folders can be added as application tabs within Teams channels,
 - Teams user can share videos from ILCS over communication channels with other team members or within meetings

- Automatic uploading of the content from a room lecture capture system as described in next chapter.
 - Multimedia files uploaded to the system shall be automatically transcoded for optimal delivery and playout on client devices.
2. Assets delivery:
- The repository must have the functionality to integrate assets into other platforms via iframe/or other functionality (eg LMS),
 - delivering directly via the user interface of the provided solution (video portal, GUI).
3. Content editing:
- System shall offer an embedded web-based user interface with basic video editing capabilities:
 - o trim, cut, add fade-in & -out, change speed of video streams
 - o switching between multiple camera angles and video sources in multi-stream recording
 - o add titles, insert frames (e.g. pictures), add slides
 - o add captions, add / edit chapters and chapter titles
 - o embedding videos from external sources such as YouTube
 - o embedding web content
 - o normalize audio levels for and across individual streams
 - User shall have ability to revert changes and restore original source files
4. Content management: management of access rights to individual content/assets is carried out at two levels:
- Manually assign access rights: content can be purely public, locked to individual user / users / groups / objects
 - Automatic assignment of access rights: e.g. based on user's membership in groups (classrooms, study programmes, etc.) or when uploading content from different platforms (eg Zoom API, Moodle Webservice,...)
5. Admin Dashboards:
- System supports multi-tenant architecture enabling independent administration and management of particular tenants (note: each UL member will represent one tenant)
 - Each tenant shall be managed by own team of administrators or power users
 - User management and permissions are granted on a tenant basis
 - Each tenant shall be capable of integrating with separate LMS instance
 - To manage the platform itself, super administrator views must be available so that the administrator can see the cumulative data about the server, platform, and user parameters.

- Support for multi-tenant architecture and management in multi-tenant deployment.
6. Player
- a. playback of videos on various terminal equipment,
 - b. Advanced player, multiple subtitles / transcript, capabilities to integrate with external auto subtitling / transcription capabilities
 - c. 2x speed (multi speed), 0,5x speed for users with special needs, 1,25x speed.
 - d. multi stream (e.g. separate playing of camera and screen capture, each user can choose desired view – picture in picture, picture next to picture, etc; these views can be predefined or self edited).
7. System shall provide analytics and reporting:
- Viewing Analytics: Track student engagement, view counts, and completion rates.
 - Heatmaps: Visualize which parts of a recording students revisit most frequently.
 - User-Level Reports: Provide insights to instructors about individual student interactions.

Lecture recording

The Lecture Capture system is primarily intended for recording lectures and other events from multimedia equipped lecture halls or from the teachers' cabinets. It shall support the following functionalities:

1. Lecture capture system shall enable real-time recording of live lectures in the classrooms and lecture halls:
 - Proposed solution shall feature a lecture recording module provided as a software running on a PC-based platforms with Windows 10 operating system or latter;
 - o Software for parallel recording of two video feeds and audio is capable of running on Intel i5 8th generation or AMD equivalent platforms, including compact form factors such as Intel NUC;
 - o provider shall specify recommended and minimum technical requirements for the hardware and operating system;
 - Lecture recording modules (either as software or standalone appliances) shall provide multi stream recording able to record at least 3 independent video and audio feeds in parallel:
 - o Video and audio sources are selectable from various sources such as embedded or USB or HDMI connected cameras, IP cameras (HTTPS, RTPS, RTP/RTCP), other USB / HDMI /IP sources, NDI and NDI HX sources, local or remote screen recording, directly connected audio sources, DANTE audio, etc.,
 - o System shall support recording in HD quality
 - o video and audio feeds shall be recorded as separate synchronized streams.

- Lecture recording module shall provide stable operation:
 - o Offline operation enabling resilience to server outages, network outages,
 - o automatic recovery of recording process when interrupted by power outages or hardware restarts.
 - Provider may also support lecture recording on a dedicated appliances:
 - o Provider shall list compliant products and their vendors if not produced or delivered by provider;
 - o Provider shall provide detailed technical descriptions and ordering details
2. Room lecture capture system shall support:
- start recording manually by user and provide simple to use (one click) controls to stop / pause recording
 - automated recording based on a predefined schedules
 - o one time or recurring events
 - o configured by administrator or imported from external system (e.g. online timetable)
 - configuring video and audio sources, target folder / space per each capturing instance and each lecture
 - configuration of recording quality for individual stream; recordings
 - visual indication of current recording status on recording device or via external indicator (light)
 - lecturer shall have the ability to control lecture recorder (e.g. start / stop / pause recordings) from room control system's touch panel or web interface.
 - Capturing multiple cameras, projection (HDMI) and audio signals in lecture halls;
3. Lecture capture system assurance and monitoring:
- Proposed solution shall enable remote administration of all connected room lecture recorders via web-based dashboard
 - Dashboard providing authorised users with umbrella overview over recording infrastructure on the level of institution
 - Monitoring dashboard shall enable previews of video feeds as well as audio signal indicating whether the recorders are picking up audio,
 - System shall have ability to send alerts to administrators if recorder is offline or if scheduled recording did not start or in case of failures that can cause recording to fail.
 - Authorised users shall have ability to control lecture recorder and preview video feeds from a smartphone or tablet.
4. System shall support live (real-time) webcasting / streaming of lecture in parallel to recording:
- Live webcasting / streaming option shall be configurable per-lecture recording
 - Live webcasting / streaming shall be configured to be available to selected users, group of users (e.g. student in a LMS classroom) or publicly
 - System supports adaptive bitrate protocol such as HLS, MPEG-DASH

5. System shall provide teachers and students with software for creating and uploading own (self) recordings:
 - Video capture software is supported for Windows 10 and later, MacOS, Linux and iOS and Android mobile devices,
 - allows recording of image and sound from multiple different sources;
 - software shall allow setting-up capture resources before recording starts
 - user can set one or more video and audio sources as well as screen capture;
 - screen capture allows the selection of any area of the screen or the entire screen;
 - embedded capabilities for basic editing of the recording provide:
 - o trim, cut, add fade-in & -out, change speed of video streams
 - o add titles, insert frames (e.g. pictures), add slides
 - o add captions, add / edit chapters and chapter titles
 - o normalize audio levels for and across individual streams
 - easy uploading of the recording to the video repository;
 - Recording offline operation – recording does not require an active internet connectivity.
6. System provides the ability to tag recordings with metadata:
 - Assets must be equipped with searchable metadata and keywords
 - automatically assigned meta data shall include: course name, date and time, lecturer
 - user has the ability to define its own metadata schemes (types of metadata)
 - Possibility to manually edit meta data through an web based interface
7. System shall provide automated upload of recordings in a cloud repository
 - system will automatically retry to upload in case of server or network failures
 - successfully uploaded recordings can be designated for lecturer's review or for instant publishing,
 - system shall enable to configure automatic assignment of user's viewing or editing permissions for uploaded recordings.
8. support for room / fixed installations, mobile / personal installations, support for conference mode (API Teams, Zoom); return channel from distant participants
9. playback of videos on various terminal equipment;
10. support with APIs to other applications of the Unified Learning Environment; schedule (alternative to the scheduler may be access control to the classroom);

Integrations

System shall provide open and well documented APIs enabling integration with external systems at UL, such as:

- a. Learning Management Systems: Moodle, Canvas

- b. Student information systems
- c. Scheduling software to collect class schedules for automated recordings

Provided solution shall support single sign-on (SSO) based on open and secure protocols such as SAML 2.0 or OpenID Connect based on OAuth2. Provided solution shall:

- integrate with Microsoft Entra ID,
- enable user authorization based on Entra ID group membership,
- enable assigning user access to content based on aforementioned group membership.

Provided solution shall seamlessly integrate with Learning Management Systems (LMS):

- UL members use Moodle and Canvas LMS; provider shall integrate ILCS with each independent LMS instance used by UL members,
- single sign-on streamlines user experience and enables users to seamlessly switch between ILCS and LMS user interfaces,
- ILCS has ability to provision its organization structure, user accounts, permission and users course enrolments based on data from LMS:
 - o automated provisioning shall assign instructors and students with appropriate roles for content creation and viewing;
 - o changes in LMS course structure, users and enrolments are synchronized and automatically reflected in ILCS.
- each UL member ILCS portal shall collect data from its respective LMS instance;
- ILCS shall enable integration via LTI standardized interface,
- ILCS features shall be available to LMS users on course level, within LMS user interface,
- Content view and edit permissions for videos in Course folder are automatically set for students enrolled in a Course and professors assigned as Teachers or Content developers of particular course,
- Instructors shall be able to record, upload, manage, organize search, share and view video content directly within LMS course pages
 - o Instructors are able to create subfolders and playlists
 - o Video content listed can be searched, sorted by name, publication date and rating
 - o Instructors can embed videos directly into Moodle news forum posts
- Users within LMS course have ability to view, search for and comment video content
- Students shall have the ability to create and upload videos as assignments,
- Grading is supported, assignments grades are integrated into course gradebook,
- ILCS based quiz results shall be automatically populated LMS for grading and reporting,
- Instructors shall have access to all video content related statistic from within the course in LMS,
- Instructors shall be able to set permissions to access individual videos; permission options shall include granting access to users within selected course, specific users or groups, sharing to users within organization via link, searchable by users within organization, available to anyone with the link, publicly available;

- The same video can be published in one or more courses whilst maintaining relation to the original source; changes in source video shall be reflected in all its clones published.

Provider shall enable integration with Student Information Systems (SIS):

- ILCS shall collect student, staff and course data, including student enrolment attributes, such as study program, enrolled courses, year of study, enrolment status, etc.
- three different SIS products are used across UL members; each Faculty and Academies uses independent instances of SIS; proposed solution shall be capable of integrating each SIS instance.
- ILCS shall be used for automated creation of content maps, portal structure and assigning access permissions to content
- proposed solution shall use unified REST APIs provided by SIS at University of Ljubljana
- The repository must be aware of the structure of the study process (e.g. Learning programmes) and support the automatisms of creating groups / subjects /courses and arranging user memberships in these entities

ILCS should provide to integrate with room control systems providing as minimum:

- control of lecture room recording start / stop / pause of recording
- system shall offer pre-integration with control systems Crestron, Extron and AMX.

System management and dimensioning

Tenderer shall offer Lecture capture with video portals and repositories as a service in the cloud solution. Tenderer shall accomplish integrations as required in this specification and provide all necessary support to UL deployment team.

Provided solution shall contain all required server resources in the cloud and all necessary software to enable Integrated Lecture Capture Solution as required in this technical specifications. Solution shall not limit lecture recording instances.

Provided solution shall support multitenancy in its design:

- each UL member institution shall have its own video portal
 - o Each ILCS portal shall be independent with ability for own GUI customization and having its own content, user and permission structure corresponding to respective LMS and SIS; each portal shall integrate with corresponding LMS and SIS
- ILCS shall support multiple levels administration structure with configurable permissions and roles, such as:
 - o system – overall - admins: management of overall ILCS on UL level

- member institution admins: managing individual ILCS portal(s), administration of rooms and resources on the level of institution, full control over its institution contributions, settings and control.
- Content management roles on course or content folder level within ILCS portal.

The tenderer should dedicate collaborator(s) to provide:

- user support to users of the product during the pilot performance,
- technical support to answer all technical inquiries and assist in preparing the specifications of possible integrations envisaged.

Provider shall assure helpdesk service available 24/7 for reporting operational issues, bugs and other user support requests. The following response time shall be obtained:

Severity	Response time (measured from time of issue reported)	Time to solve issue, measured from time of issue reported (T)
Critical	30 min	3 h
Major	30 min	Same working day
Minor	2 h	1 working day

The tenderer should be available to respond to users' inquiries, questions and remarks within one working day.

It is essential for the tenderer to actively assist and propose UL in using functionalities or integrations that are not envisaged so far.

Timeframe and costs

System has to be ready for service by 30th of September 2024, by which would include the system to be fully implemented, data migrated and all administrative training completed.

Initial pricing shall include all costs for delivering ILCS for a period of 24 months:

- costs of server side hosting in the provider's cloud including storage, processing capabilities required to support ILCS operation at UL in the stated quantities;
- lecture recording and client side software or licenses required;
- system deployment and integrations as stated in this specification;
- user support and response times;
- Collaboration with UL deployment team and project management;
- Import of existing digital assets (recordings);
- System administrators and users trainings.

Provider may additionally quote (provide pricing and project discounts) for one to 4 types of recommended dedicated hardware and software recorders by their choice.

Other requirements

Lecture capture and video platform are deployed as a cloud-hosted service:

- data collected, processed and stored is compliant to The General Data Protection Regulation (GDPR)
- all data is processed and stored on the servers inside EU member states