Bachelor's Thesis
Extending the Online Exam System Xaminer with Streaming Capabilities

Dipl.-Ing. Dr. Markus Weninger, BSc
Institute for System Software
T +43-732-2468-4361
markus.weninger@jku.at

Student: Tobias Herber
Advisor: Dipl.-Ing. Dr. Markus Weninger, BSc
Start date: December 2022

The exam system Xaminer is used by the Institute for System Software and other institutes to provide online exams for students. To improve the experience for both, lecturers and students, the system is constantly being improved and extended. Especially the need for a supplementary streaming service to provide video and audio connection between the lecturers and the students narrows the user experience.

Thus, the goal of this thesis is to develop a streaming service built into Xaminer. For this, the student has to perform the following steps:

- Evaluate:
  - the suitability of WebRTC (https://webrtc.org/) to transport the lecturer's video and audio (webcam + microphone) to students, as well as transporting up to 30 video and audio streams (one per student, webcam or desktop capture + microphone) to the lecturer. If WebRTC proves to be a non-optimal choice for this kind of task, the student should perform research on how to achieve this streaming goal.
    - If the chosen technology makes it necessary to implement server-side features (such as a websocket server), the goal is to achieve up to 300 concurrent streams (i.e., up to 10 lecturers with 30 students each). The thesis should contain at least theoretical thoughts on whether this goal is realistic.
    - As another subgoal, the student has to assess whether it is possible to force the students to share all screens, not only one specific screen if multiple screens are connected.
  - whether it is possible for a lecturer to display all streams at once, and if not, how many streams can be displayed at once and how easy these streams can be switched (for example, displaying 10 student streams at a time, and by clicking a button switching to the next 10 students).
    - This evaluation can be performed in a standalone prototype application – this application does not have to provide high user experience but focuses on assessing the technical feasibility.
- Integrate the streaming functionality into Xaminer. Currently, Xaminer offers lecturers a list of all connected students that states whether they already finished the exam or not. On this view, it would be desirable to display each student's video stream next to the student's list entry. A feature to display a given student's video in full screen has to exist.

Modalities:
The progress of the project should be discussed at least every four weeks with the advisor. A time schedule and a milestone plan must be set up within the first 3 weeks and discussed with the advisor and the supervisor. It should be continuously refined and monitored to make sure that the thesis will be completed in time. The final version of the thesis must be submitted not later than 31.05.2023.