

Master's Thesis

**Adding multi-tenancy and a flexible permission system
to the online examination tool Xaminer**

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The coronavirus outbreak in 2020 strongly changed the way how teaching is performed at universities. Most classes switched to an online teaching mode – including digital exams. While teaching mostly went back to teaching in presence, a number of exams are still performed digitally. For this, the online examination tool Xaminer has been developed at the Institute for System Software at the JKU. Since its first version, the tool has been expanded into various directions but has stayed a JKU-only service.

The goal of this thesis is to generalize Xaminer to allow different institutions to hold exams using the tool (“multi-tenancy” / “multi-institutional”, both terms will be used interchangeably). When registering a user, the user should be assigned to an existing tenant, for example to “Johannes Kepler University”. Currently, a user can only see their own exams, while Xaminer administrators can see all exams. With the change to multi-tenancy, at least one new user group must be added, namely tenant-admins, i.e., persons who can manage settings for their institution and who can see all exams of their institution.

Since exams and their submissions are sensible data, tenants might be hesitant to store them on externally hosted databases. Thus, each tenant should be able to provide a connection string to their locally hosted database (as a proof-of-concept, connections to PostgreSQL are enough for this thesis), as well as mail server settings and credentials to send mails via their own mail server. If these settings are not provided by a tenant, exams will be stored and mails will be sent using Xaminer’s database / mail server.

Also, it is currently not possible to allow multiple users to work on the same exam, i.e., only the exam owner - the person who created a given exam - is able to edit and manage it (for example, to enter the participants of a certain exam). Since multiple lecturers often want to work together when designing an exam (or secretaries want to be able to enter the participant lists), also an extended rights/permission system should be put in place. Exam owners should be able to give other people of their institution the rights to edit exams (e.g., add new questions) or to manage the exam’s participants. It should be able to define new permissions in the future, i.e., the permission system should be extendable.

To better monitor which operations have been performed when in Xaminer, extended logging should be performed. Information about changes to database entities should be stored, allowing administrators to query these changes if needed.

A nice-to-have-feature would be to support OAuth or SAML SSO login for users, for example via JKU’s Shibboleth Single-Sign-On system or using one’s Google account.

Modalities:

The progress of the project should be discussed at least every three to four weeks with the advisor. A time schedule and a milestone plan must be set up within the first two 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 is expected to be finished before the 31.10.2024.