SEB Server User Guide

Andreas Hefti

Contents

Master:

Development:

Note regarding to CVE-2021-44228: SEB Server is **not affected** by the vulnerability. For more information please read Log4J2 Vulnerability and Spring Boot

However, to prevent security scanner to alert false-positives we decided to make a patch for the latest version of SEB Server (v1.2.6) including the Log4j 2.16.0 library. If you want to update please make sure your installation refer to version v1.2-stable, v1.2-latest or v1.2.6. Then simply make a update/rebuild of your seb-server docker image.

Contents

About

The Safe Exam Browser Server web application simplifies and centralizes the configuration of Safe Exam Browser clients for exams. It interacts with a learning management or exam system for setting up and conducting e-assessments with Safe Exam Browser. It also improves security by allowing to monitor connected Safe Exam Browser clients in real time during e-assessments.

What is Safe Exam Browser (SEB)?

Safe Exam Browser (SEB) is an application to carry out e-assessments safely. The freeware application is available for Windows, macOS and iOS. It turns any computer temporarily into a secure workstation. It controls access to resources like system functions, other websites and applications and prevents unauthorized resources being used during an exam. Safe Exam Browser can work with Open edX to control what a student can access during a Open edX quiz attempt. With the SEB Open edX plugin you activate the SEB support in Open edX and now only students using an approved version of SEB and the correct settings will be able to access the quiz in your Open edX course. The Safe Exam Browser is offered under a Mozilla Public License and supported by the SEB Alliance.

What is Safe Exam Browser Server (SEB Server)?

While the interaction with SEB is well known in Learning Management Systems (LMS) like Open edX, Moodle etc. the SEB Server is an entirely new component to set up secured online exams. It interacts with the assessments system/LMS as well as with SEB on exam clients.It supports exam scenarios on student owned devices (BYOD) and on managed devices.

SEB Server is a modern webservice with a REST API and a GUI service on top of it. SEB Server is written in Java and uses Docker for installation and setup.

SEB Server provides a range of basic functionalities:

- Built-in institutional multitenancy

- Linking of multiple Learning Management Systems (LMS). Currently supported: Open edX

- Accessing the Course/Exam-API of a linked LMS to import a courses or exams for managing with SEB Server

- Creation and administration of SEB Client Configurations that can be used to startup a SEB and that contains SEB Server connection information for a SEB Client

- Creation and administration of SEB Exam Configurations that can be bound to an imported Exam to automatically configure a SEB Client that connects to an exam that is managed by SEB Server

- Automated SEB restriction on LMS side if the specified type of LMS supports the SEB restriction API

- Monitoring and administration of SEB Client connections within a running exam

The image below shows a very simplified diagram that locates the SEB Server in a setup with a Learning Management System (LMS) and the Safe Exam Browser (SEB). The SEB Server communicates with the LMS for managing and prepare exams as well as with the SEB Client to ensure a more automated and secure setup for high-stake exams.
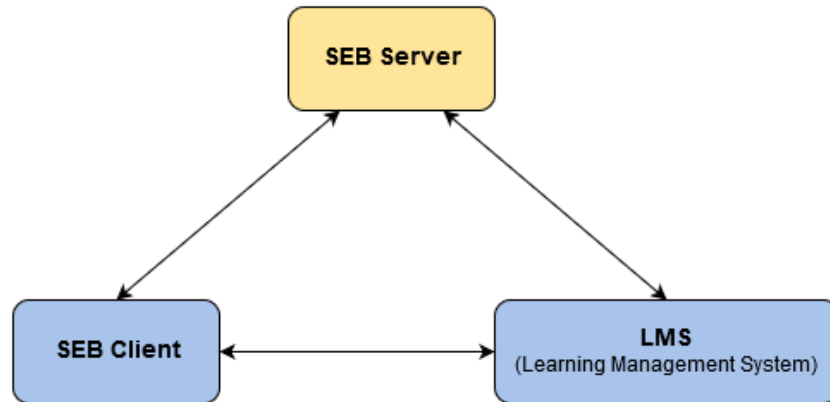
SEB Server Version 1.3.0 is out

New features:

- Table Filter: Enter input on filter input field triggers filter action

- New: "Exam Templates" to predefine exam configurations that can be applied on exam import

- Exam Configuration: Copy exam configuration on exam configuration table view

- Exam Templates: Add an exam configuration template via exam template to automatically create an exam configuration on import

- Exam Templates: Add indicators for exam template that are automatically applied on exam import

- Monitoring: Add new filter to filter active connections (without any incidences)

- Monitoring: Add connection summary for each connection state filter to show how many connections are present per state

- Monitoring: Improved and extended connection information about user/login change and display client info like SEB version, OS Version...

- Monitoring: Improved distributed setup with Docker/Kubernetes

- Monitoring Notifications: Added Raise-Hand Notification and SEB Lock-Screen Notification

Bugfixes:

- Various distributed setup cache issues

- Fixed Sorting of exam in exam list

- Fixed LMS Lockup quizzes filter

- Fixed Exam proctoring settings verification

- Various proctoring issues for proctoring with Zoom

Changes:

- Overall: Extended GUI server session timeout

- User Roles: Enhanced "Exam Administrator" role to see all running exams and be able to support them as well

- LMS Lockup/Exam: Show Moodle course name together with the quiz name on LMS lockup as well as on exams

- Exam Configuration: Streamline "Exam Configuration" settings with the newest SEB versions

- Monitoring: Improved indicator and monitoring data performance for distributed setups

- Monitoring: Changed default colors for active connections and indicators (No color if no incidence)

Docker-Image:

Exact version: docker pull anhefti/seb-server:v1.3.0 (sha256:35692e304ab8f7d198524ff948df472e1eb362f1eb7f0b0fa358d015560
Latest stable minor version with patches: docker pull anhefti/seb-server:v1.3-latest

SEB - SEB Server Compatibility

The table below shows available and upcoming SEB client versions that has SEB Server integration support and are compatible with particular SEB Server version. There is an entry for each platform with a beta or testing release date and a official release date.

SEB Server Version 1.0.X

Platform / OS	Beta/RC Version	Release Version
SEB Client for iOS	22. April 2020 - Version 2.1.50	Q2 2021 - Version 2.5/3.0
SEB Client for Mac	Q2 2021 - Version 3.1	Q2 2021 - Version 3.1
SEB Client for Windows	Q2 2020 - Version 3.1	Q4 2020 - Version 3.1

SEB Server Version 1.1.X

Platform / OS	Beta/RC Version	Release Version
SEB Client for iOS	22. April 2020 - Version 2.1.50	Q2 2021 - Version 2.5/3.0
SEB Client for Mac	Q2 2021 - Version 3.1	Q2 2021 - Version 3.1
SEB Client for Windows	April 2021 - Version 3.2	May 2021 - Version 3.2

Install SEB Server

For a complete guide to install SEB Server please go to SEB Server Installation Guide

Getting started with SEB Server

For a complete SEB Server user guide please go to SEB Server User Guide

CHAPTER 8

Project Background

The SEB Server is currently build and maintained by the Swiss MOOC Service that is founded by leading Swiss universities EPFL, ETH, SUPSI, USI and HES-SO. The Swiss MOOC Service was financially supported from 2018-2020 by the Swissuniversities´ P5 program.

SEB Server User Guide

9.1 Table of Content

9.1.1 Overview

Safe Exam Browser Server (SEB Server) is a web-service application with the objective to help setting up and maintain e-assessments with Safe Exam Browser (SEB) in a centralized and more efficient manner. The SEB Server application can be used by an institution or organization as a self-maintained, lightweight server application to organize and setup their e-assessments. For an organization or institution that wants to provides safe e-assessments with Safe Exam Browser, SEB Server can help to organize this e-assessments more effectively, safely and in one place. Furthermore SEB Server can be setup and run within a cloud infrastructure by general service provider to offer e-assessments with SEB and SEB Server as a service.

SEB Server comes with a built-in multi-tenancy functionality that allows to create and maintain institutions that are separated by each other. This is most convenient for smaller groups of organizations or institutions that want to have one self maintained SEB Server instance but need internal separation of institutions.

Since SEB Server is generally an administration tool, meaning used to do administration work and tasks to setup and maintain e-assessments, there is yet just a built-in and lightweight user-account management where users can register itself and get needed privileges assigned by already registered administrator users that has the privileges to maintain user accounts. Currently there is no possibility to register with a third party account and/or single sign on.

SEB Server is written mainly in Java and uses Docker for installation and setup. For more information about the architecture and installation, please go to SEB Server Installation Guide

The key features of SEB Server are:

- Built-in multi-tenancy capabilities. Create and manage institutions as separated clients.

- Lightweight user-account management where users can register itself and get needed privileges assigned by already registered administrator users that has the privileges to maintain user accounts.

- Track user activities within user-activity-logs for the whole SEB Server or the a client.

- Create, export and maintain SEB connection configurations. Those are needed to startup a Safe Exam Browser client with and contain all information to connect securely to the SEB Server.

- Create and maintain SEB exam configurations. Those are sent to a SEB client on connection setup and contain all SEB settings for a particular e-assessment.

- Setup and maintain Learning Management Systems (LMS) like Open edX or Moodle to be able to navigate and find courses or quizzes on the LMS and to push access-restrictions to the LMS if supported by the LMS

- Import and maintain courses or quizzes form a LMS. Setup everything that is needed for an e-assessment that is based on a course or quiz form the LMS

- Apply indicators to the exams to indicate incidences while monitoring running e-assessments.

- Monitor running e-assessment and have an overview of all connected SEB clients. Manage SEB client connections and view logs sent by individual SEB clients.

Roles and Use-Cases

The SEB Server supports a simple role based privilege system where a role has read, modify and write privileges on certain domain entities. The privileges for a role are pre-defined and cannot be changed by a user. But roles can be combined for a user-account. A user-account for example can have the "Exam Administrator" and the "Exam Supporter" role active to be able to setup and support an exam (e-assessment) within one user-account.

Privileges for domain objects are categorized in read, modify and write rights. Write right includes creation and deletion grants as well as activation grants in addition to the more restrict modify right that only allows to modify already created entities. They are also categorized in overall, institutional and owner privileges where overall means for all entities, over all available institutions and institutional means only the entities that belongs to the own institution whereas owner-privilege means the creator or assigned owner of an entity.

There currently exists four different roles. This reflect a good separation of concern within the SEB Server application administration itself and the setup and maintaining work that has to be done for e-assessments with SEB. Below are the names and a short description of each role.

SEB Server Administrator

This role is primarily to administer the SEB Server application, to create new and maintain available institutions and user-accounts. In addition to that a SEB Server administrator also has overall read privileges for the most domains to be able to analyze problems and help others to solve them.

A typical use-case for a SEB Server administrator would be to create a new institution and an institutional administrator for this institution. Another use-case would be to maintain registered user accounts, to give more privileges. Or to entirely deactivate an existing user account.

Institutional Administrator

An institutional administrator has overall read access for its institution and is able to modify the institution properties as well as create new or maintain existing user-accounts for the belonging institution. Furthermore an institutional administrator is able to create and maintain learning management system (LMS) setups and SEB connection-configurations for the belonging institution.

A typical use-case for a institutional administrator would be to give the appropriate roles and privileges to newly registered users of the institution. Or another use-case would be to create and maintain SEB connection configurations for the institutions and setup and maintain learning management systems within the SEB Server and the belonging institution.

Exam Administrator

With this role a user is able to prepare an exam for an e-assessment with SEB. A exam administrator is able to view all courses from all learning management systems that are setup for the belonging institution and find a particular course to import this course as an exam within SEB Server. This role is also able to create and maintain SEB exam configurations that can then be assigned to an imported exam. After setting importing an exam, the role is able to

setup all aspects of an exam like automated restrictions, allowed supporter and monitoring indicator, to name a few, and prepare the exam for an e-assessment.

A typical use-case for an exam administrator would be to create a SEB exam configuration within the templating and configuration section. Then to find a particular course or quiz from the learning management systems that is defined within the institution. This course or quiz can then be imported by the administrator as an exam. After import an exam administrator is able to prepare this exam for run and monitoring by attaching a exam configuration to it, prepare indicators to monitor incidences and specify the SEB access-restriction conditions for the course or quiz.

Exam Supporter

This role is to support a running exam within SEB Server. An exam supporter is able to see the running exams on that he/she has an assignment and can open them either for monitoring or editing some exam attributes during the exam.
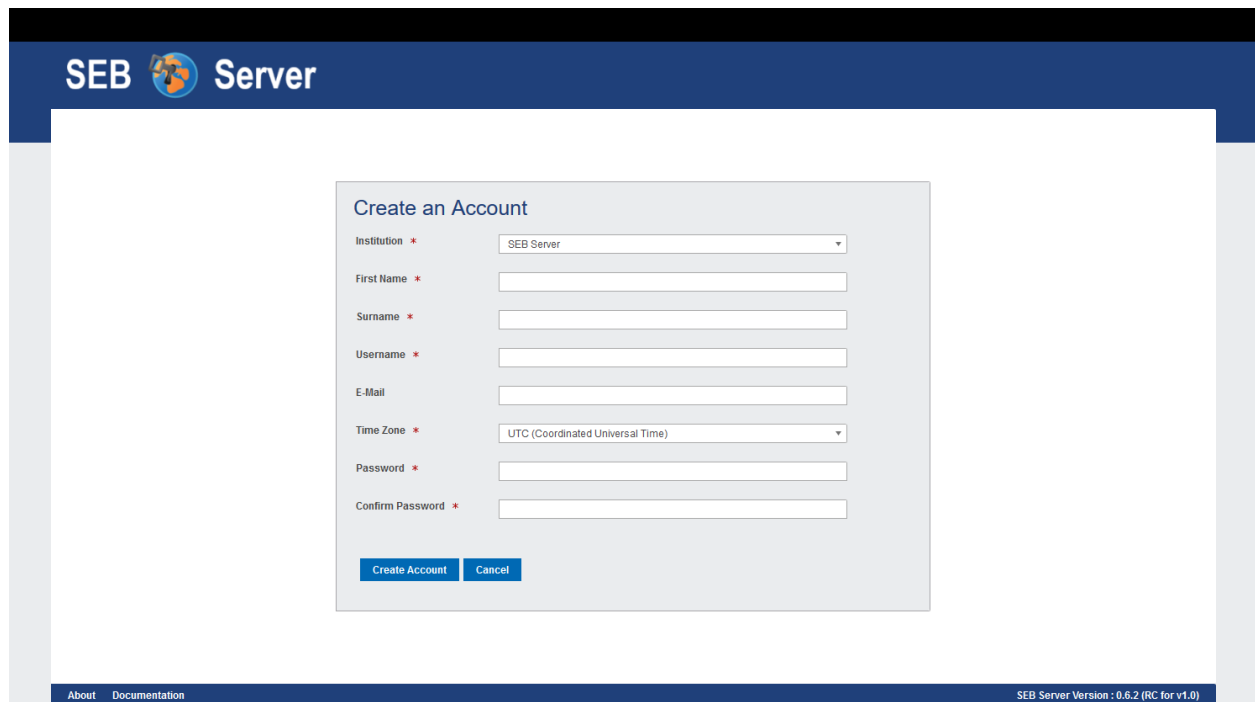
A typical use-case for an exam supporter would be when the time an exam is running, to overview the connecting SEB clients and manage them. While SEB server shows incidences or irregularities, a exam supporter can act on them and take the appropriate actions if needed.

Sign Up / Sign In

What one will see first when applying to a SEB server application is the login-screen

If you are already registered you can use your username and password to log in. Or use the "Register" button to go the the register page to create a new user-account. The newly created user account will only have the Exam Supporter role assigned. If you need another role or more privileges, this must be given and granted by an institutional administrator of the belonging institution.

Fill in the register form and create a new account. After the user account has been successfully created, the application redirects to the login page for login. On the current version, e-mail confirmation is not a feature of the SEB Server application and therefore the e-mail address is just informative by now.

With the "Time Zone" you can choose a specific time zone for your user-account. All dates and times will then be showed within this time zone.

Graphical User Interface

After successful login, you will see the main graphical user interface of the SEB Server application. On the left hand are the activities that can be done, categorized within some few main sections with its relating activities underneath. By selecting a activity, the main content section will show the activity content and the action that are possible for this activity on the right hand side.
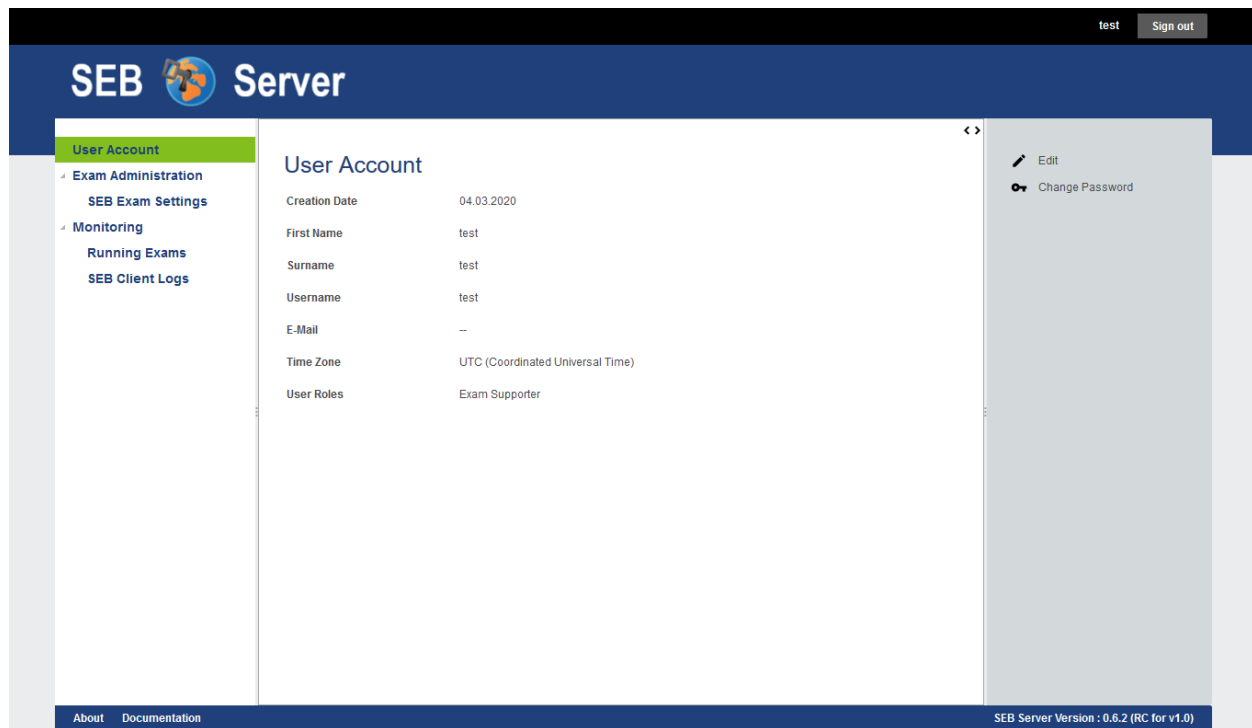
In the header above on the right hand, we see the username of the currently logged in user and an action button the sign out and go back to the login page.

The main content usually consist of a list or a form.

Lists

A list shows all the objects of a particular activity in a table page. A list has paging functionality and the list has more objects than fitting all on one page, a page navigation is shown at the bottom of the list with the information of the current page and the number of pages along with the page navigation that can be used to navigate forward and backward thought the list pages.

Almost all lists have the ability to filter the content by certain column filter that are right above the corresponding columns. You can use the column filter input to filter the list and to narrow down a specific collection of content. Accordingly to the value type of the column, there are different types of filter:

- Selection, to select one instance of a defined collection of values (drop-down).

- Text input, to write some text that a value must contain.

- Date selection, To select a from-date from a date-picker. A date selection can also have an additional time selection within separate input field

- Date range selection, To select a from- and a to-date within different inputs and a date-picker. A date range selection can also have an additional time range selection within separate input fields

User Activity Logs

Institution	User	User Activity	Domain Type	Date
SEB Server	sebserver-admin	Modify	User Account	04.03.2020, 10:16
SEB Server	sebserver-admin	Password Change	User Account	04.03.2020, 10:16
SEB Server	sebserver-admin	Create New	Institution	04.03.2020, 10:17
SEB Server	sebserver-admin	Activate	Institution	04.03.2020, 10:17
SEB Server	sebserver-admin	Create New	User Account	04.03.2020, 10:18
SEB Server	sebserver-admin	Activate	User Account	04.03.2020, 10:18
SEB Server	sebserver-admin	Modify	User Account	04.03.2020, 15:28
SEB Server	sebserver-admin	Deactivate	User Account	04.03.2020, 15:28
SEB Server	sebserver-admin	Activate	User Account	04.03.2020, 15:28
SEB Server	sebserver-admin	Create New	Institution	04.03.2020, 15:29
SEB Server	sebserver-admin	Activate	Institution	04.03.2020, 15:29
Swiss MOOC Service	sms-admin	Create New	LMS Setup	04.03.2020, 10:19
Swiss MOOC Service	sms-admin	Activate	LMS Setup	04.03.2020, 10:19
Swiss MOOC Service	sms-admin	Create New	Exam	04.03.2020, 10:19
Swiss MOOC Service	sms-admin	Modify	Exam	04.03.2020, 10:19
Swiss MOOC Service	sms-admin	Create New	Exam Configuration	04.03.2020, 10:20
Swiss MOOC Service	sms-admin	Modify	Exam Configuration History	04.03.2020, 10:20
Swiss MOOC Service	sms-admin	Create New	Client Configuration	04.03.2020, 10:20
Swiss MOOC Service	sms-admin	Activate	Client Configuration	04.03.2020, 10:20
Swiss MOOC Service	sms-admin	Create New	Exam Configuration Mapping	04.03.2020, 10:20

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A list can be sorted within a column by clicking in the column header. The order of sorting can be changed by clicking again on the same column header of the sorted column. If sorting functionality is available for a column depends on the column type. There are a few columns that do not have a sort functionality yet. Most columns have a short tool-tip description that pops up while the mouse pointer stays over the column header for a moment. A column tool-tip usually also explains how to use the column-related filter.

Forms

Forms are used for domain entity specific data input or presentation, like HTML Forms usually do. Forms appear in three different ways within the SEB Server GUI:

- When a domain entity is first created in edit mode

- When a domain entity is modified also in edit mode

- And when a domain entity is just shown, in read-only mode

The following images shows the same form, once in read-only mode and once edit mode

There usually is a tool-tip on a form field element for almost all attributes that can be activated by either going over and stay on the form field label or the input section. If a form field is mandatory to either create or save an entity, this is marked with a little red arrow just to the right of the form field label. There may also be more field validation takes place on saving the object. If a input needs a special form that is not given by the current input, the form-field will be marked with a red border around the input field and a thin red explanation text is shown right below the input field. After correcting the missing or wrong input and saveing the form again, the SEB Server will accept and process the changes.

Note: If you navigate away from a form in edit mode, the GUI will inform you about possible data loss on this action and will prompt you to proceed or abort the action.

9.1.2 Institution

Overview

The institution section within SEB Server is used to support built-in multi-tenancy functionality to allow using SEB server as a light-weight stand-alone server but with the possibility to separate operation completely within different institutions.

Note: If a quick use-case based reference suites you better, just forward to the "Use Cases" section of this chapter below

Only the role of SEB Server administrator and institutional administrator are able to see and use this section. A SEB Server administrator is able to see the whole list of all existing institutions and to create new and maintain every institution within a SEB Server, while a institutional administrator is only able to see the belonging institution and is able to modify this institution but not to change activity or create new institutions.

If a SEB server administrator clicks on the "Institution" section on the left hand menu, the application will show the a list of all available institutions. The list can be filtered with the filter above and can be sorted by clicking on the column one would like to sort the list in.

Note: The possible actions are in the action pane on the right hand side and the actions that belongs to a list entry are only active if a list entry is selected.

Currently an institution has a name, an optional url-suffix and an optional logo upload attribute.

- The **Name** is mandatory and must be unique within the SEB Server application.
- The **URL-Suffix** is optional and defines a suffix that can be used within the browser URL to access the SEB Server within this institution. The institution logo and theme will then be shown.
- The **Logo** upload where a image can be uploaded to be used as logo for the institution.

Note: The logo ideally should have a dimension around 300 pixel width and 80 pixel height to fit well into the logo section of the page. Currently only .png, .jpg and .jpeg image-files are supported.

As an institutional administrator only the institution one belongs to can be seen and be modified by the user. The user will see the institution form in view mode by clicking on the "Institution" section on the left hand menu and is able to edit the attributes of the institution like changing the name of the institution or upload a new institutional logo. An institutional administrator is not able to activate or deactivate its own institution, therefore a SEB Server administrator role is needed.

Use Cases

Create a new Institution

Note: To create a new institution one need a SEB Server administrator role.

The SEB Server application is setup as a single instance but needs to support several institutions with the services that must be completely separated from each other. It should also be possible for an institution to have a separate, single start URL to access the application with a web-browser and have the own logo.

- Login as a SEB Server administrator and select the "Institution" menu-item from the left hand side menu.

- A list of all existing and available institutions will be shown.

- Select "Add Institution" form the right hand side action pane to create a new institution.

- The creation form will be shown and the user is able to define a name, url-suffix and or upload a logo for the new institution.

- After giving all information, the new institution can either be saved and remains inactive until activation or can be saved and automatically be activated within the same step. Use the "Save Institution" action on the right side to just save the institution or the "Activate Institution" action the save and activate within the same step.

- In either case the form input will first be verified and if there is missing something or has wrong input, the save action will be postponed and the edit form will present the missing input within a red box and some inform text right below the input field for correction.

- If successfully saved, the application will show the form of the newly created institution in read only mode and if already activated other user, that are allowed to, can see the institution now.

Change the name/logo of an existing or own Institution

Note: This scenario differs in case of having a SEB Server administrator or institutional administrator role

As SEB Server administrator

- Login as a SEB Server administrator and select the "Institution" menu-item from the left hand side menu.

- A list of all existing and available institutions will be shown. Use the filter above to find the institution to change.

- Select the institution and use the "Edit Institution" action on the right side action pane to open the institution in edit mode.

- To upload a new logo, click on the upload-icon just beside the logo input field. The application will show a file-picker dialog. Use the file-picker dialog to search and select the logo file. Use the "Upload" action-button to upload the selected file. The selected logo should appear as an image within the image upload input field of the institution form.

- Apply the changes and save the institution. If all given information is correct and nothing is missing, the application will. show the changed institution form in read only mode.

As an institutional administrator

- Login as an institutional administrator and select the "Institution" menu-item from the left hand side menu.

- The form of the own institution is shown in read-only mode. Use the "Edit Institution" action from the action pane.

- The form of the own institution is now shown in the edit mode and the name or logo of the institution can be modified.

- To upload a new logo, click on the upload-icon just beside the logo input field. The application will show a file-picker dialog. Use the file-picker dialog to search and select the logo file. Use the "Upload" action-button to upload the selected file. The selected logo should appear as an image within the image upload input field of the institution form.

- Apply the changes and save the institution. If all given information is correct and nothing is missing, the application will show the changed institution form in read only mode.
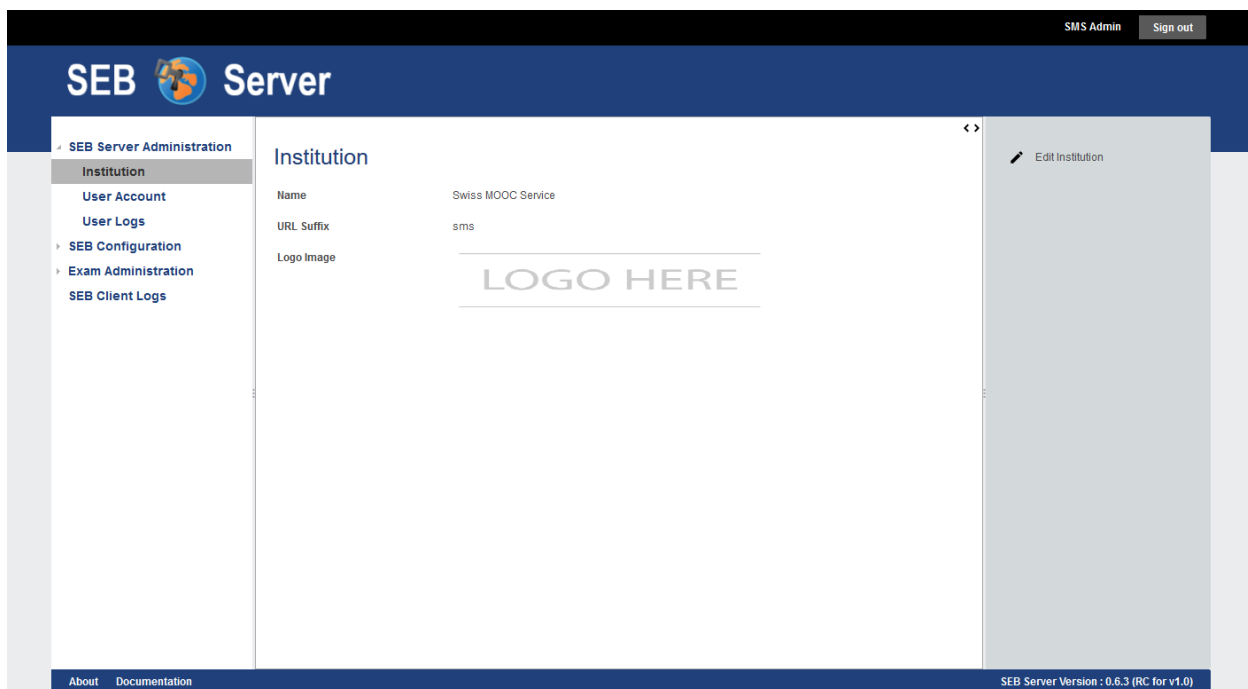
Activate / Deactivate an existing institution

An institution is shown to other users and ready for applying user-accounts and other entities only if it is active. An inactive institution can only be seen by a institutional administrator of this institution or by a SEB Server administrator that are able to see all institutions.

To activate an institution for the first Time one can either use the "Activate Institution" action form the action pane on the right side within the read only mode of the institution form or with the same action on the edit mode while also saving the applied modifications of the form.

To deactivate an institution one can use the "Deactivate Institution" action form the action pane on the right side. When an institution is been deactivated, also all existing and active entities that belongs to this institution are deactivated too. This affects user-accounts, configurations and LMS Setups. On deactivation action, the application will search the affected entities and will inform the administrator about the number of the affected entities and asks for confirmation. After Confirm the deactivation the institution and all affected entities will be deactivated. This means also the user-accounts that has not a institutional role or the SEB Server administration role, will not be able to login anymore.

9.1.3 User Accounts

Overview

The user-account section within SEB Server can be used to create new or modify user-accounts for other user or to modify the own user account and changing the password. This section differs most for the different roles in SEB Server.

Note: If a quick use-case based reference suites you better, just forward to the "Use Cases" section of this chapter below

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A user account always belongs to one institution and has some basic attributes;

- **Institution**: A combo- or single-selection to choose the institution the user account belongs to. This is mandatory and one user-account can only belong to one institution.

- **First Name**: The first name of the user

- **Surname**: The surname of the user

- **Username**: The username within SEB Server. This name is used to login.

- **E-Mail**: The E-Mail address for the user. This currently has only informational purpose and is neither used to confirm an account or to send automated mails.

- **Time Zone**: The time zone the user belongs to and to which the dates and times are converted to for display it to the user in the GUI. See also the note about time zone below.

- **User Roles**: A multi-selection input to define all roles a user account has. See also the note about roles below.

- **Password**: This password input field appears only while creating a new user-account or while self-register a user-account.

- **Confirm Password**: This password input field appears only while creating a new user-account or while self-register a user-account.

Note: The date and time values within the SEB Server are always stored in universal time (UTC) and converted from and to the time zone a user account has defined. The time zone of the user account is usually labeled and the UTC time is shown below if possible.

Note: The role selection is only displayed for user-accounts that has user-account modification privileges like SEB Server administrator and institutional administrator. Roles can be combined by selecting more then one role. For more information about roles and each role see the section *Roles and Use-Cases*

By selecting the "User Account" section on the left side menu, a SEB Server administrator will see a list of all user-accounts of all institution within a SEB Server instance. The filter above the list can be used to search a certain user account. Use the:

- **Institution** filter to select a certain institution and show only the user-accounts that belongs to this institution.

- **First Name** filter to search for user-accounts with the given occurrence of text in the First Name.

- **Surname** filter to search for user-accounts with the given occurrence of text in the Surname.

- **User Name** filter to search for user-accounts with the given occurrence of text in the Username.

- **Mail** filter to find an user-account by e-mail address

- **Status** filter to select the either and see either only active, only inactive or all user-accounts

To view all information of a user-account, double-click in a certain user-account entry from the list or select an entry from the list and use the "View User Account" action on the right action pain. The user account form will be shown in read only mode with all account information. To edit this user-account use the "Edit User Account" action on the right action pane. To change the password of the user
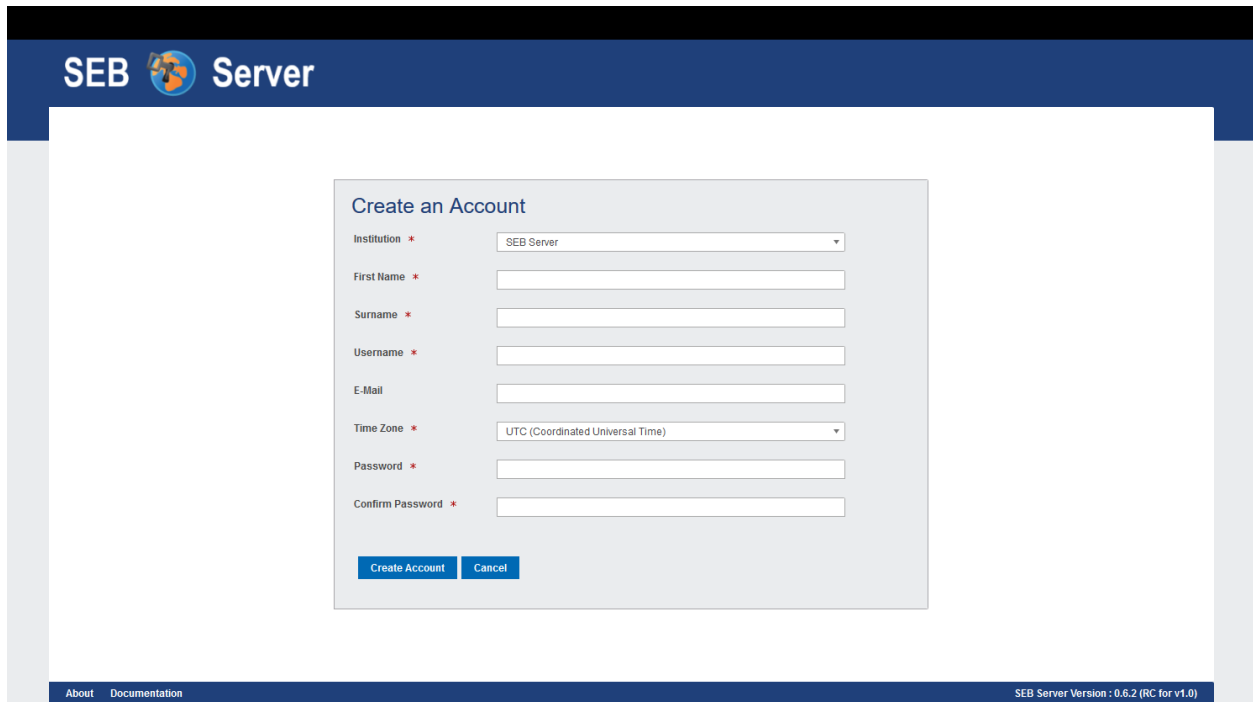
Use Cases

Register as a exam supporter

Registering as a new user is possible only within the SEB Server form-registration yet. Since the SEB Server is mainly a service for administrative work, there is no third party registration and login in place so far. A self-registered user-account has the single role of an Exam Supporter and since this user-account is not applied to an exiting exam and running, the user is only able to see and edit its own account settings. Another user with Exam Administrator role can then assign the new user-account to an exam for support and monitoring. Or one other user-account with Institution Administrator role can edit the new user-account and give it more privileges.

To register a new user-account follow the steps below

- Use a Web-Browser and go to the SEB Server login page by entering the SEB Server URL.

- Click the "Register" action on the login page that is shown right after the "Sign In" action.

- The application will show the registration form. See the image below.

- Enter all mandatory account data within the form and use the "Register" action to confirm.

- If there is missing or wrong data, the registration form will highlight the concerned input fields with a red border and information text just below the field.

- If everything is accepted the user-account is created and the application forwards automatically to the login page.

- Sign in with the user credentials to check the account works correctly.

Once signed in, the user can see all sections for a Exam Administrator as shown in the image below. Because the user is not assigned to any Exam as a supporter yet, the "Exam Administration" and "Monitoring" sections are empty. The user is only able to change the account settings.
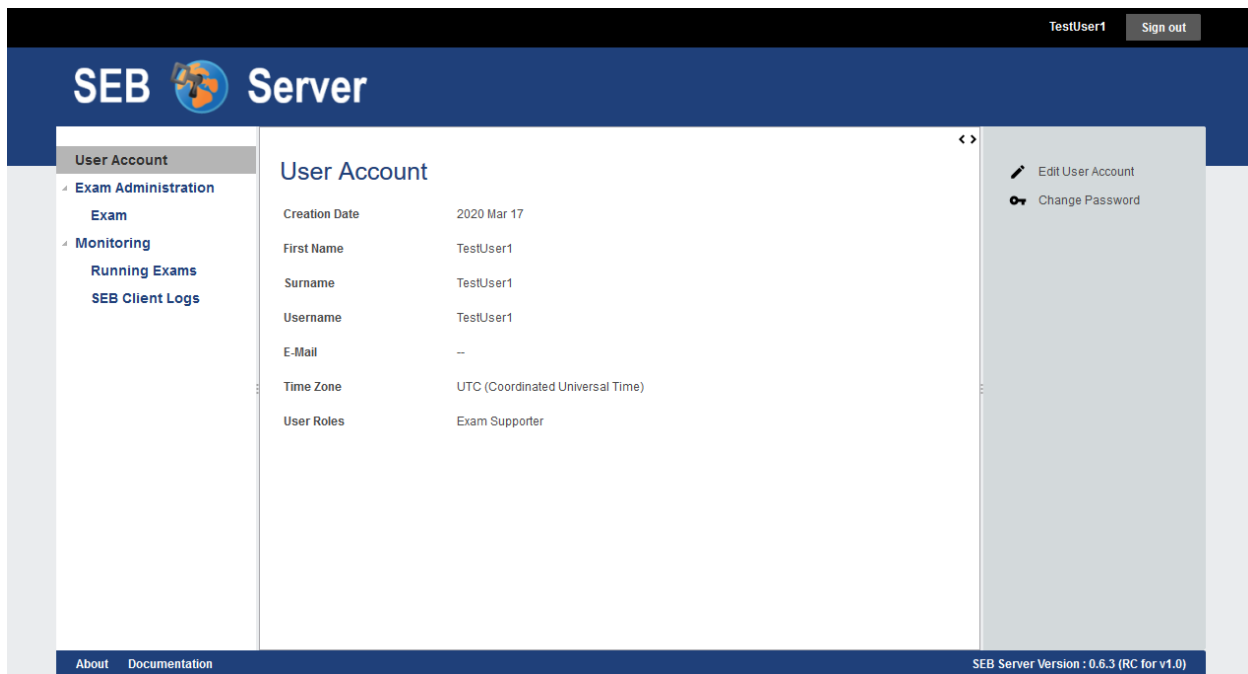
Create new user-account

As a user with user-account write privileges (SEB Server administrator and institutional administrator) one can create new user-account for others. This must usually be done if a particular user is not able to register itself for whatever reason or if internal policies prefere this kind of registration. A a user with with user-account write privileges you can create a new user-account as follows;

- Login to SEB Server application with your own account an click the "User Account" section on the left side menu.

- Use the "Add User Account" action from the action pane on the right hand-side to create a new user-account.

- Enter all mandatory account data within the form and use the "Register" action to confirm.

- If there is missing or wrong data, the registration form will highlight the concerned input fields with a red border and information text just below the field.

- If everything is accepted the user-account is created and the application shows the user-account form in view mode.

- Now the administrator can give the created user credentials directly to the user with the advice to immediately change the password.

Modify user-account

As a user with user-account write privileges (SEB Server administrator and institutional administrator) one can modify user-accounts of others while all other users can only modify its own account settings.

- Login to SEB Server application with your own account an click the "User Account" section on the left side menu.

- As a user with user-account write privileges one will see the list of all available user-accounts. Find the user-account that must be modified by using the filter above and double-click on the respective list entry to open the user-account form in view mode

- Without user-account write privileges, a user will just see its own user-account form in view mode.

- Use the "Edit User Account" action from the action pain on the right to change to edit mode. Apply all needed modifications and save the user-account by using the "Save User Account" action from the action pane.

- If there is missing or wrong data, the registration form will highlight the concerned input fields with a red border and information text just below the field.

- If everything is accepted the user-account is created and the application shows the user-account form in view mode.

Change password

As a user with user-account write privileges (SEB Server administrator and institutional administrator) one can change the password also for others while all other users can only modify change its own password. The current password must be known to change the password.

- Login to SEB Server application with your own account an click the "User Account" section on the left side menu.

- As a user with user-account write privileges will see the list of all available user-accounts. Find the user-account that must be modified by using the filter above and double-click on the respective list entry to open the user-account form in view mode

- Without user-account write privileges, a user will just see its own user-account form in view mode.

- Use the "Change Password" action on the right action pane to open the change password form.

- No you must fist give the correct old password and the new password then with confirmation.

- Use the "Save New Password action form the right action pane to save the new password settings.

- If you are changing your own password and everything is correct, the application will automatically log you out and prompt you to sign in with the new password.

- If you are changing the password of another user-account the application and everything is correct, the application direct you back to the user-account form in view mode and show a confirmation message.

Activate / Deactivate user-account

Users with user-account write privileges (SEB Server administrator and institutional administrator) are able to activate/deactivate user-accounts of others. A inactive user-account prevent a user to sign-in. There are several different ways or places where the status of a user-account can be changed

- On the list view while one list entry is selected, by using the "Activate User Account" or "Deactivate User Account" action from the action pain at the right side. There will be automatically appear the proper action in relation to the selected list entry and whether it is already active or inactive.

- In the user-account form in view mode by using the "Activate User Account" or "Deactivate User Account" action from the action pain at the right side. There will be automatically appear the proper action in relation to the current user-account.

- If one creates a new user-account there is the possibility to create and activate the user-account by using the "Activate User Account" action from the action pain on the right side.

- The same situation appears for inactive user-accounts in edit mode.

Delete a user-account

Users with user-account write privileges (SEB Server administrator and institutional administrator) are able to delete user-accounts of others.


Note: Please be aware that deletion means full deletion form the persistent storage, all data will be lost.

A user account can be deleted with all dependencies that belongs to the user-account. This includes:

- All exam configuration the user has created and is owner of

- All exams the user has created and is owner of and all dependencies of an exam to like indicators, configuration mappings and all monitoring data if present

- Login to SEB Server application with your own account an click the "User Account" section on the left side menu.

- As a user with user-account write privileges will see the list of all available user-accounts. Find the user-account that must be deleted by using the filter above and double-click on the respective list entry to open the user-account form in view mode.

- Use the "Delete User Account" action from the right action pane to open the deletion dialog.
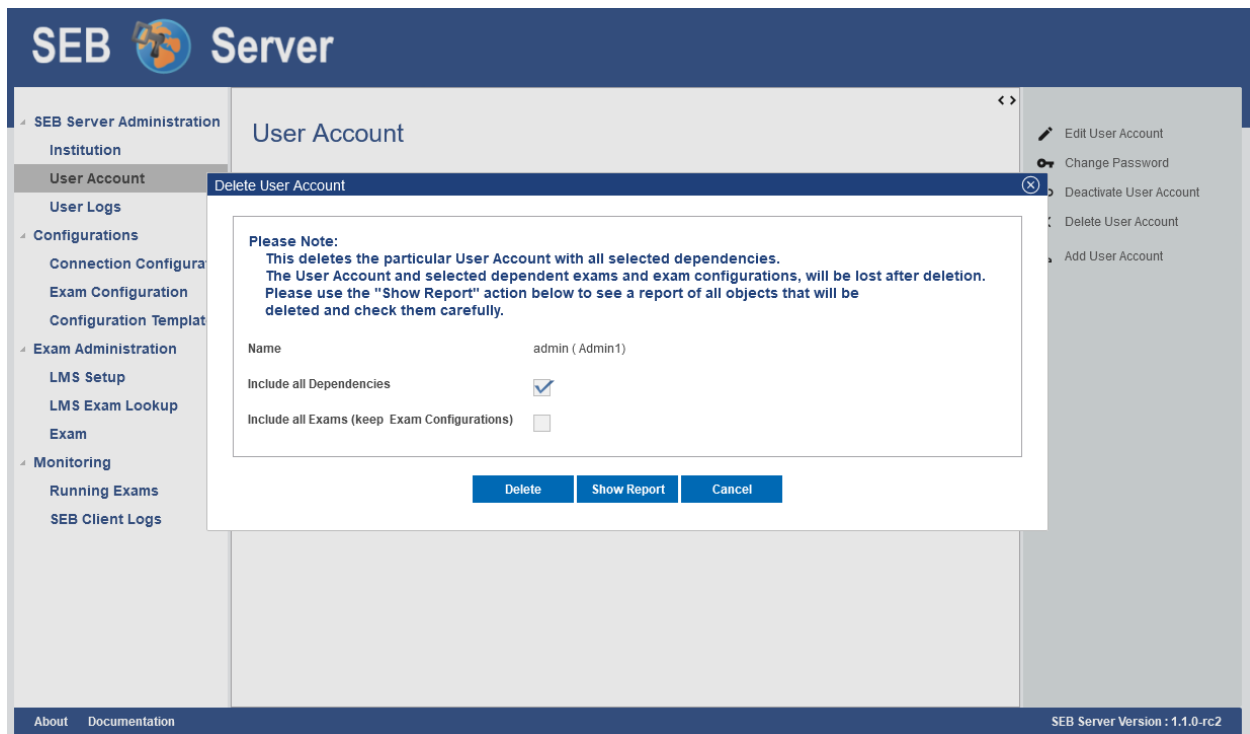
- **Within the delete dialog you are able to delete either**

    – Only the user-account with no dependencies at all (no selection)

    – The user-account with all dependencies (Include all Dependencies)

    – Or the user-account with only the exam dependencies, keeping the exam configurations (Include all Exams)

- After you have made your choice, you can show a report that will show all dependencies that are deleted within the action. Use the "Show Report" action below the delete dialog to show the report or just use the "Delete" action to execute the delete.

- In the deletion report you are able to check carefully every object that will be deleted within the action.
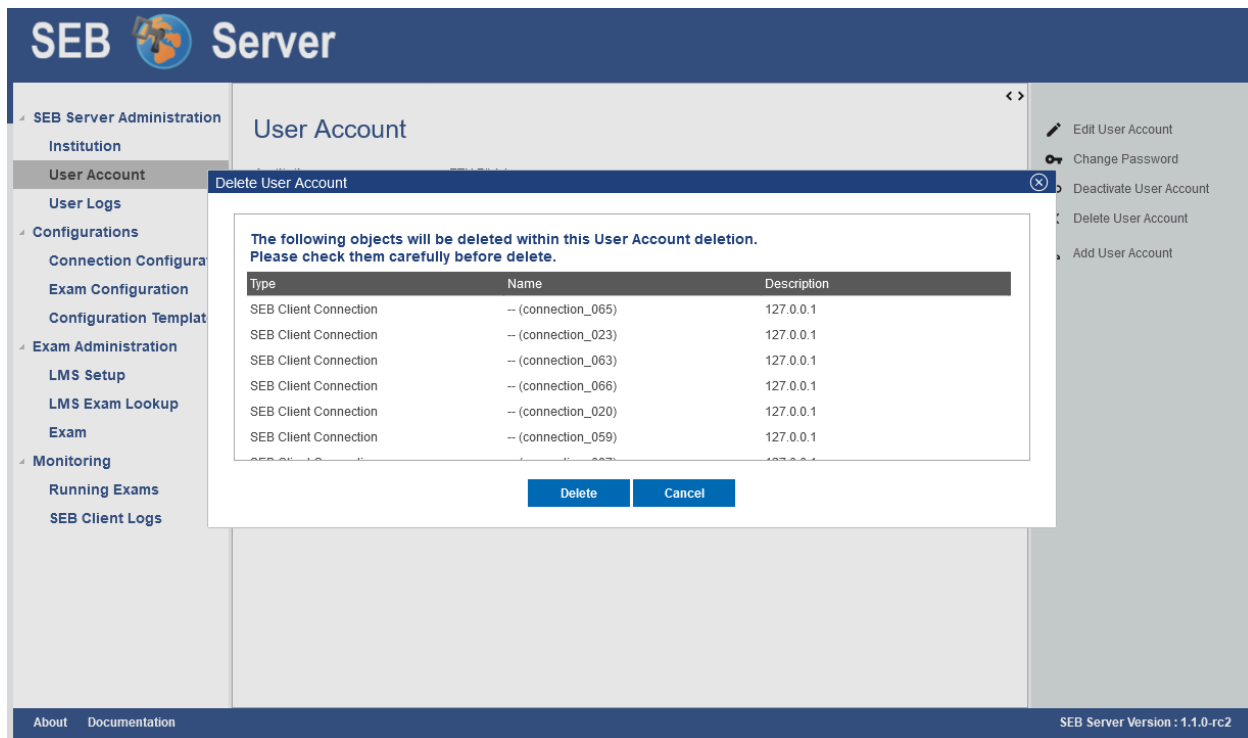
9.1.4 Learning Management System Setup

Overview

To be able to connect to a learning management system (LMS), to view and manage the courses provided by a LMS is an essential feature of the SEB Server. To setup an exam or e-assessment for SEB on SEB Server that is based on a course from a LMS, we have to make a binding to the course on the LMS. This is also used to always get the actual course data from LMS like start- end-time, name and others. Another feature of SEB Server that needs a LMS communication is the SEB restriction. A SEB restriction will restrict course access on the LMS only for connection with Safe Exam Browser and will also check if a Safe Exam Browser of trust is used and the right configuration is used by the Safe Exam Browser that was defines for the exam on the SEB Server.

Course API

This API, provided by the LMS, is used by the SEB Server to query the available courses and the needed data for each course. This API is needed to be able to import a course from the LMS as an exam into SEB Server and configure the course as an e-assessment with SEB. Usually this API comes as a REST or SOAP API with the core LMS implementation or a plugin.

SEB Server supports this course API's so far:

- Open edX: The standard system Open edX REST API. The SEB Server uses the "courses" endpoints to get course data.

- Moodle (Course Access): The standard system Moodle REST API. The SEB Server uses the standard Moodle rest endpoints to get course data. Please note that a second Moodle integration part for SEB access restriction with Config-Key will follow together with a Moodle plugin in a future version of SEB Server

SEB restriction API

If the automated SEB restriction functionality is available for a LMS depends on the following requirements:

- There must exist a SEB integration plugin that offers an API to put and pull SEB restrictions in the form of Config-Keys and/or Browser-Exam-Keys To the LMS and a specific course on the LMS to restrict the access. Such a plugin may also offer additional restriction features like restricting on course section or course components or only for specified user roles.

- The SEB integration plugin must be installed on the LMS that is used by the SEB Server.

For more information about known SEB integration plugins that are supported by the SEB Server see *Install SEB restriction API plugin*

Regardless if a supported LMS is missing the SEB integration plugin installation, the LMS can be used with the Course API and a exam setup will be possible but without automated SEB restriction feature.

To be able connect to an LMS from SEB Server, we need to create an API access-account on the LMS side that can be used by the SEB Server to access the API of the LMS. How to do this for the different supported types of LMS see *API Access Account on LMS* After such an account was created the account credentials, username and password, can be used by the SEB Server to connect to the LMS. Therefore we need to create a LMS Setup on the SEB Server.

A SEB Server administrator role will be able to see the institution to which the LMS Setup belongs to while an institutional administrator is only able to see and create LMS Setup for its own institution. The name of the LMS Setup should be unique and is to identify a LMS SEB Server internally. Use the "Type" selector to specify the type of the LMS to bind to the SEB Server within the LMS Setup. Currently supported are:

- **Testing**: This is for testing purposes only and can be used to mock a LMS to test exam settings. This type provides some mock-up courses within the LMS API of the SEB Server that can be seen in the LMS Exam Lookup once the LMS text setup is active. This mock-up courses can be imported and configured as exams like they would exist. But note the a SEB client that is trying to connect to such a course would not be able to connect to the LMS since it is not existing. But a SEB client is able to download the defined exam configuration for testing.

- **Open edX**: This type is to bind an existing Open edX LMS system that is available on the Internet or intranet. The SEB Server tries to make use of the above described API's of the Open edX system.

Note: If you want to use the automated SEB restriction feature too, the Open edX SEB Plugin must be installed properly on the LMS.

- **: Moodle**: This type is to bind an existing Moodle LMS system that is available on the Internet or intranet. The SEB Server tries to make use of the described API's of the Moodle system but there is currently no SEB restriction plugin available that works with SEB Server. Note that Moodle integration is implemented partially within SEB Server version 1.1.x. Only the course access feature is implemented and the course restriction feature will come with a future SEB Server release

The "LMS Server Address" is the root URL to connect to the LMS server with HTTP over the Internet or intranet. This is usually the the URL that is also used with the Browser to connect to the main page of the LMS system. And additionally the credentials that has been created with the creation of the *API Access Account on LMS* has to be set in the LMS Setup the make the SEB Server able to securely connect to te LMS. The API credentials that consists of a client-name and a client-secret must be used with the "LMS Server Username" and the "LMS Server Password" fields of the LMS Setup form on SEB Server.

If the SEB Server running behind a proxy server or a firewall between SEB Server den LMS, the additional proxy settings can be used to setup the proxy-connection.

Note: To Setup a Test LMS Setup (of type "Test") only a correct URL pattern must be set like "http://test" for example. And API credentials can be anything but must be set.

After all the settings for a LMS Setup has been set, one can use either the "Save LMS Setup" action to save the LMS Setup without activation or the "Activate LMS Setup" action to also activate the settings right after they has been successfully saved. Anyway for both action there is a intial test that, additionally to the usual field validation that takes place first, tries to connect to the LMS with the given API details. If the connection was'nt successful the SEB Server will inform the user about a possible reason of failure. Otherwise SEB Server shows a success message and the created LMS Setup can be used.

Use the "Activate / Deactivate LMS Setup" action to activate an inactive LMS Setup or the deactivate a active LMS Setup.

Note: On deactivation of an LMS Setup, the system checks on depending object and will show a confirmation to the user asking that all depending objects will also been deactivated. Depending objects of an LMS Setup are exams that has been imported from the specified LMS Setup in the past.

Use Cases

Create a new LMS Setup for Open edX

A new Open edX system has been installed within your institution and to be able to use the system also for e-assessments with SEB and SEB Server, you have to bind the LMS to the SEB Server.

- If not already done, install the Open edX SEB Plugin on the Open edX system first.
- If you don't already have an API access account on Open edX side, create one
- Sign into SEB Server with your institutional administrator role account.
- Navigate to "Exam Administration" / "LMS Setup" within the navigation on the left hand side.
- Use the "Add LMS Setup" action from the right action pane to open a LMS Setup creation form.
- Give a unique name to the new LMS Setup for internally identification.
- Set the main URL that points to the new LMS system. This is usually the the URL that is also used with the Browser to connect to the main page of the LMS system
- Set the API credentials that has been creates within step two (client-id, secret).

- Use the "Activate LMS Setup" action on the right action pane to test, save and activate the new LMS Setup within one step.

Note: If some form attributes are missing or not correct, the SEB Server system will respond with the usual form validation errors. If the connection to the LMS is failing because of missing or wrong credentials or for any other reason the system is not able to connect to the LMS the SEB Server will notify a error dialog to the user.

Change API Credentials of an Active LMS Setup

The API access account on the LMS has been expired and you have to create a new one or update the old one which both result in new API access credentials that has to be set on the existing LMS Setup on the SEB Server.

- Sign into SEB Server with your institutional administrator role account.

- Navigate to "Exam Administration" / "LMS Setup" within the navigation on the left hand side.

- Use the Filter above the list to find the specified LMS Setup.

- Select the LMS Setup from the list and use the "Edit LMS Setup" action from the right action pane to open the LMS Setup in edit mode.

- Set the new credentials and make sure, the LMS Setup is still active.

- Use the "Save LMS Setup" action form the right action pane to save the changes and test the connection.

Note: If some form attributes are missing or not correct, the SEB Server system will respond with the usual form validation errors. If the connection to the LMS is failing because of missing or wrong credentials or for any other reason the system is not able to connect to the LMS the SEB Server will notify a error dialog to the user.

Deactivate LMS Setup

A LMS system that was running on your campus to provide e-assessment with SEB and SEB Server has been shout-down and you need to also deactivate the setup and exams on the SEB Server for this LMS.

- Sign into SEB Server with your institutional administrator role account.

- Navigate to "Exam Administration" / "LMS Setup" within the navigation on the left hand side.

- Use the Filter above the list to find the specified LMS Setup.

- Select the specified LMS Setup from the list and use the "Deactivate LMS Setup" action from the right action pane.

- Alternatively you can also double-click on the LMS Setup to fist go into the detailed view of the LMS setup and use the "Deactivate LMS Setup" action there.

- The system informs you about the number of depending exams that also will be deactivated within the deactivation of the LMS Setup.

- Confirm the deactivation and notify that the LMS Setup now is listed as "Inactive" in the list.

- Navigate to "LMS Exam Lookup" to make sure the courses form the deactivated LMS Setup are not available anymore.

- Navigate also to "Exam" and make sure that all previously imported exams from the deactivated LMS Setup are not available anymore.

API Access Account on LMS

Create Open edX API Access Account

To be able to create an API access-account on Open edX you need a user-account with staff and administration privileges.

For Open edX Hawthorn and Ironwood versions following the steps below::

- Login to Open edX LMS Administration with an appropriate user-account that has administration rights. And find the Users section:

- Create a new User-Account that acts as an API account. The account must at least have the permissions to query the course API of Open edX and to access the seb_openedx plugin permission.

- Make sure that "Staff" status is checked for the account.

- Back in the administration homepage, find the OAUT2 - Client section and create a new API Client Access for the given User-Account. The Client id and Client secret are automatically generated by Open edx.

Once the client registration was successful the client id and client secret can be used within the SEB Server to access the course- and SEB-restriction API of Open edX as described in the next step section

Note: Since Open edX Juniper is using Django Oauth Toolkit instead of Django Oauth Provider the last step in the above guide looks slightly different. Please see below the last step for setting up on an Open edX Juniper version.

- Back in the administration homepage, find the DJANGO OAUTH TOOLKIT - Applications section and create a new API Application Access for the given User-Account. The Client id can be defined and the Client secret is automatically be generated by Open edx.

Create Moodle API Access Account

To be able to create an LMS Setup for Moodle you need a Moodle administrator or manager account. You can then use this account in the LMS Setup to connect the the LMS.

Since SEB Server uses some functions from the Moodles mobile API, you have to make sure the web services for mobile apps are enabled within your Moodle setup. To do so please login to Moodel with an administrator account and go to "Side Administration", scroll down to "Mobile App" and choose "Mobile Settings.
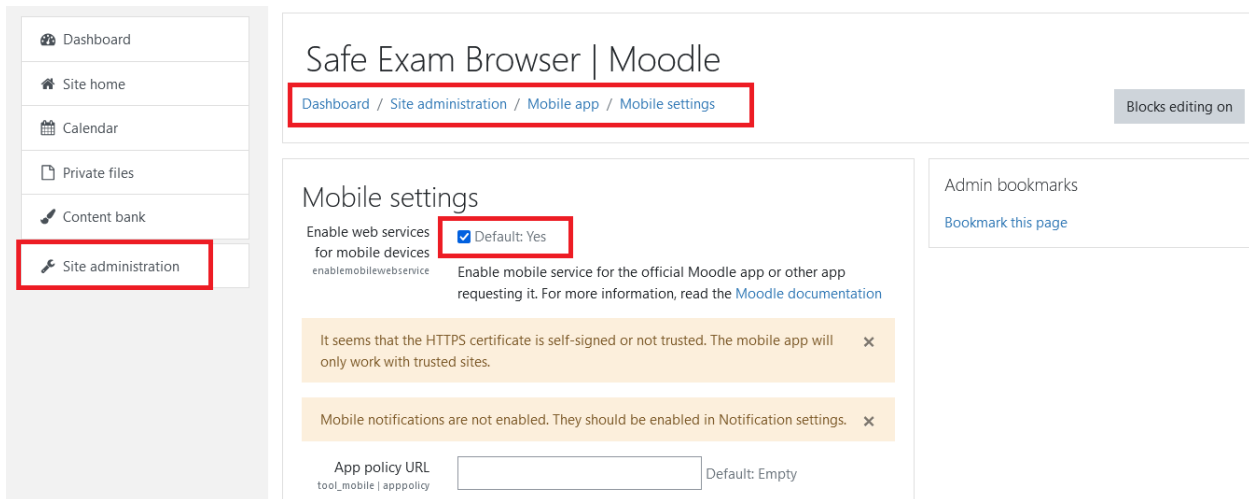
If you have a restrictive Moodle setup and troubles with the Moodle API account to use with SEB Server, please try to import the following Moodle role profile within youe Moodle instance. This profile will create a SEB Server role within Moodle that can be used to apply to an API account to be used with SEB Server. The role defines only the necessary privileges and functions needed for SEB Server communication.

Moodle role and account settings: `XML`

Install SEB restriction API plugin

Open edX SEB Plugin

> **There is a SEB integration plugin developed and supported by eduNEXT.**
>
> > - Documentation
> > - Repository

9.1.5 SEB Configurations

There are two different kind of SEB specific configurations that must be defined and be put in place to support e-assessments with SEB and SEB Server. The is used to configure SEB with all needed information to securely connect to SEB Server and an Exam Configuration is used to configure SEB to access a running exam with SEB. The is only needed at least once for an institution and must be deployed as start-configuration on a managed SEB setup or can be placed as a download link within an internal trusted server, that automatically loads within the SEB application and configures the SEB to connect to the SEB Server.

An exam configuration, as the name implies, is done for an exam and contains most of the known configuration attributes from the latest SEB Configuration Tool Currently an exam configuration can only be applied to one Exam but can easily be copied to use with another exam. For detailed information about exam configuration see *Exam Configuration*

Within Configuration Templates, it is possible to create templates for exam configuration. Within the current version of SEB Server there is the possibility to define different default value(s) for each exam configuration attribute and also to define if the attribute is been shown in the exam configuration or not. This allows an Exam Administrator to create a exam configuration template for exams with context defines default values and also to be able to only see change the attributes that are relevant for an exam configuration. This feature is currently in an experimental state and may be changed and / or expanded within future releases of SEB Server. See *Exam Configuration Templates*

An new feature since SEB Server version 1.2 is the integrated certificate store where an administator is able to upload and register certificates. The certificates can then be used to encrypt and secure a connection configuration for example.

Or as planed for another SEB Server release, to embed into an exam configuration for SEB to allow certificate pinning on SEB - LMS communication.

Connection Configuration

Overview

A connection configuration is needed to configure a SEB client to securely connect to the SEB Server and present a list of available exams for selection. At least one connection configuration is needed for an institution that can be exported and deployed with a SEB on a managed device setup or can be made available within a download link on a internal or trusted server. Another scenario would be to send the connection configuration to individual students per mail with instructions on how to install SEB and start it with the configuration to automatically connect to the SEB Server. However, since the connection configuration is security relevant because it contains sensitive data to connect to SEB Server, there are different security level one can choose to apply within a internal safe e-assessment strategy.

The lowest level of security is to just have one not encrypted connection configuration for the whole institution and for all e-assessments provided at this institution with SEB Server. In this case the sensitive data is more exposed to be compromised and misused by others because of the missing password protection and it also takes more effort to deal with such an issue while there is only one connection configuration used by all e-assessments of the institution. If the one client configuration has been compromised and a misuse has been detected the concerned connection configuration can be deactivated to prevent further misuse. A new one can be created and delivered or updated but since it is only one configuration used for the institution all actual download links have to be updated and all students awaiting a prepared exam has to be informed and supported with the new configuration (link)

The currently highest level of security is to have encrypted and different connection configuration for different e-assessment. In this case the connection configuration is encrypted with a password that can be defined by a institutional- or exam-administrator while creating the connection configuration. Once the SEB loads such a connection configuration it will fist prompt the user about the password that must be given by the student to proceed and connect to the SEB Server.

Usually a connection configuration can be created or maintained by an institutional administrator or by an exam administrator. Exam supporter role has no access to connection configurations and a SEB administrator is able to see connection configurations of other institutions but not to create or modify them.

You can see a list of all available connection configuration for an institution by going to the sub-section "Connection Configuration" of the "Configuration" section on the menu on the left hand side.

The list shows the name, the date of creation and the status of the connection configurations in a column. With SEB Server administrator role also an institution column is shown because a SEB Server administrator is able to see all connection configurations of all institutions. As usual, to filter the list use the filter inputs above and click on the lens symbol on the right to apply the filter and to clear the filter use the clear symbol right to the lens symbol. See *Graphical User Interface* for more information about the list navigation.

The image below shows the Connection Connection form in the edit mode. To view the fallback related attributes, check the "With Fallback" attribute or remove selection to hide all fallback related attributes.

Short description of all attributes of a connection configuration:

- **Name**: The name of the connection configuration used to maintain connection configurations within the SEB

Server application.

- **Configuration Purpose**: Defines the configuration purpose as described in SEB Configuration section "Use SEB settings file for". **Starting an Exam**; Will cause SEB to use this connection configuration settings on startup but won't change local SEB settings. **Configuring a connection**; Will cause SEB to use this connection configuration settings and also save it as local SEB settings.

- **Configuration Password**: Used to encrypt the connection configuration with a password. A SEB client will prompt this password while loading a password protected connection configuration.

- **Encrypt with Certificate**: Since version 1.2. Used to encrypt the connection configuration with a certificate. The same certificate must be known by a SEB client to be able to load the configuration.

- **With Fallback**: Select this to see and define a fallback strategy for SEB clients using this connection configuration in case of SEB Server service unavailability.

- **Fallback URL**: Defines a start URL that is loaded by the SEB client in a fallback case.

- **Connection Attempts**: Defines the number of attempts a SEB client will try to unsuccessfully connect to the SEB Server service until it switches to the fallback case.

- **Interval**: Time interval (in milliseconds) a SEB client will wait after a unsuccessful connection attempt before starting a next connection attempt.

- **Connection Timeout**: A overall timeout for SEB Server service connection. After this timeout runs out, starting from fist connection attempt, SEB client will switches to the fallback case no matter if number of attempts has exceeded or not.

- **Fallback Password**: If set, a SEB client will prompt for this password before switching into the fallback case.

- **Quit Password**: If set, a SEB client will prompt for this password when a user wants to exit SEB before in fallback case or before the SEB client has loaded an exam.

A connection configuration may also contain and define a fallback strategy that takes place when SEB Server service is not available while a SEB client tries to connect to the SEB Server.

Note: A fallback case only takes place when SEB client is within the connection process (handshake) with the SEB Server and the SEB Server service is unavailable. If a SEB client is already connected to the SEB Server and the user has started an exam, the SEB will just proceed with the exam even when the SEB Server connection is (temporarily) unavailable.

The fallback strategy contains some connection attributes that define until when a SEB client considering SEB Server service as unavailable as well as attributes that defines how a SEB client has to proceed in the fallback case. How a SEB client reacts to a fallback case differs on the configuration settings in the following ways:

- **Connection configuration with "Configuring a Client" setting and no fallback strategy:** Show warning message with options "retry" and "quit".

- **Connection configuration with "Configuring a Client" setting and fallback strategy:** Show warning with options "retry", "fallback" (load Fallback URL) and "quit".

- **Connection configuration with "Starting an Exam" setting and no fallback (without local client configuration):** Show warning message with options "retry" and "quit".

- **Connection configuration with "Starting an Exam" setting and no fallback (with local client configuration):** Show warning message with options "retry", "load local settings" and "quit".

- **Connection configuration with "Starting an Exam" setting and fallback strategy:** Show warning with options "retry", "fallback" (load Fallback URL) and "quit".

Use Cases

Create Connection Configuration

As an Institutional Administrator you should create a new secure connection configuration for the upcoming semester. The setup shall operate with secure configurations because the configuration file may be exposed to the public Internet. And the setup shall also have a proper fallback strategy where SEB clients uses the a given start URL in fallback case.

- Sign in as an Institutional Administrator and select the "Connection Configuration" sub-menu of the "SEB Configuration" main-menu on the left.

- Use the "Add Connection Configuration" on the right action pane to create a new connection configuration.

- Give the new connection configuration a name that not already exists and select "Start an Exam" for "Configuration Purpose". This will ensure that a SEB client that uses this configuration will not override the local configuration that then can be used on fallback.

- Give a password to ensure security and to encrypt the connection configuration on export. A SEB client will prompt for the password while loading this configuration.

- Check "With Fallback" to show all the fallback related attributes.

- Define a fallback URL that will be used by a SEB client as start URL in the fallback case.

- Define also fallback case, how many connection attempts on what interval a SEB client shall try before going into fallback mode. You can also define a overall "Connection Timeout" if lapsed a SEB client will also go into the fallback mode. A SEB client will fall-back on either the attempt or the timeout trigger.

- When a SEB client goes to fallback mode it will prompt the user as described in the case list above. To prevent further fallback options with a password prompt, give a "Fallback Password" and / or a "Quit Password" that a SEB client will prompt on either the fallback- or the quit-option.

- After all details are correctly been entered, use the "Save Connection Configuration" action on the right action pane to save the new connection configuration.

- Now the new connection configuration is created but not active for now and therefore cannot be exported yet.

Activate and export Connection Configuration

A connection configuration for the upcoming semester has been created so far but was not active until now because of security reasons. Now we want to activate this connection configuration and export it to make it accessible by a download link on a public server.

- Sign in as an Institutional Administrator and select the "Connection Configuration" sub-menu of the "SEB Configuration" main-menu on the left.

- Use the list filter and / or the list navigation to find the needed connection configuration.

- Double-click on the list entry or use the "View Connection Configuration" action on the right for a selected list row, to show the details of a specific Connection configuration.

- Then either on the list or in the view mode of the form, use the "Activate Connection Configuration" action on the right action pane to activate the connection configuration

- Now there is a "Export Connection Configuration" action in the detail view of the connection configuration. Use the "Export Connection Configuration" action to start a download dialog. Choose "Save As" and download the file with the name "SEBServerSettings.seb".

- This file can now be published as download-link within a public server where SEB user can click and start the download and startup of the SEB client automatically.

Deactivate a Connection Configuration

The semester has ended and for security reasons we don't want that SEB clients with a connection configuration for the ended semester are able to connect to SEB Server anymore. For this we just have to deactivate the connection configuration for that semester. A SEB client that connects with this connection configuration will then receive an HTTP 401 Unauthorized response.

- Sign in as an Institutional Administrator and select the "Connection Configuration" sub-menu of the "SEB Configuration" main-menu on the left.

- Use the list filter and / or the list navigation to find the needed connection configuration and select the row of this connection configuration.

- Now use the "Deactivate Connection Configuration" action from the right action pane to deactivate the connection configuration.

- The connection configuration is now deactivated and SEB client using this connection configuration are not able to connect to SEB Server anymore.

Encrypt the Connection Configuration by password or certificate

To secure the used connection configuration you want to encrypt it with either password or certificate encryption. If you encrypt a connection configuration by password, SEB will promt the user for the password while loading the configuration whereas by using certificate encryption, a SEB client must know the same certificate that is been used for encryption while loading the configuration.

- Sign in as an institutional administrator and select the "Connection Configuration" sub-menu of the "SEB Configuration" main-menu on the left.

- Create an new connection configuration or use the list filter and / or the list navigation to find the needed connection configuration.

- Fill in the settings as usual and for password encryption define a password in the "Configuration Password" field and confirm the password in the "Confirm Password" field.

- For a certificate based encryption select one of the given certificates within the "Encrypt with Certificate" setting.

- To upload new certificates that can be used for encryption, please refer to: *Certificates*

- "Use asymmetric only encryption" if you use SEB Clients with version before 2.2. For more details on this subject please see: SEB Configuration

- Save and activate the connection configuration. The connection configuration will then be encrypted by either password or certificate on export.

Exam Configuration

Overview

An exam configuration defines all the SEB settings for an exam. A SEB client that is connecting to SEB Server and an exam defined by the SEB Server is downloading this exam configuration from SEB Server and reconfigure itself before accessing the exam on the learning management system (LMS) and present it to the user.

Note: For more information and detailed description of the SEB settings, see SEB Configuration. Currently not all settings are available and some has different uses. For details about differences see *SEB Setting Differences*

An exam administrator is able to create, modify and maintain exam configurations while the SEB Server administrator and the institutional administrator role have only read access either for all exam configurations or for the exam configurations of the institution. A exam supporter role is able to see and modify only the exam configurations to which the user-account is assigned as supporter.

To view the list of available exam configuration go the the sub-menu "Exam Configuration" within the menu "SEB Configurations" on the left hand side. The list shows the name, the description and the status of the exam configurations in a column. With SEB Server administrator role also an institution column is shown because a SEB Server administrator is able to see all exam configurations of all institutions. As usual, to filter the list use the filter inputs above and click on the lens symbol on the right to apply the filter and to clear the filter use the clear symbol right to the lens symbol. See *Graphical User Interface* for more information about the list navigation.

To view details of a specific exam configuration either double-click on a list entry or select a list entry and use the "View Exam Configuration" action from the right action pane. In the detail view all general settings are shown and also a list of exams that uses this exam configuration. In the current version of SEB Server, an exam configuration can only be assigned to one exam.

Note: For the actual SEB Server version it is not possible to assign the same exam configuration to more then one exam. This because it shall be possible to change configuration settings for running exams when no active SEB clients are connected within the specified exam. This is manageable for one exam but is going to become confusing if more exams are involved. But there is the possibility to copy an existing exam configuration to use the same for another exam.

The status of an exam configuration defines its visibility and assignment possibilities. If an exam configuration is still in the creation process and shall not be to an exam yet, it should stay in the "Under Construction" status. This is the default status while creating a new exam configuration. Once a exam configuration is done and ready for assignment, one can change this status to "Ready To Use". Exam configurations wihtin this status are available for selection and assignment on exams. When a exam configuration is assigned to an exam the status changes automatically to "In Use" and the SEB settings of the exam configuration will appear only in read mode for default.

An exam configuration has a general settings part (like other domain objects has within SEB Server) that defines the name, description and status of the exam configuration that are used to maintain the exam configurations SEB Server internally. And a exam configuration has, separated from the general settings, the SEB settings that contains most of the SEB setting attributes as they are provided by the SEB.

Note: For more information and detailed description of the SEB setting attributes, see SEB Configuration. Currently not all settings are available and some has different uses. For details about differences see *SEB Setting Differences*

The SEB settings differ from the general form-settings also in how they are managed and stored on server-side. Unlike the form-settings, the SEB settings are arranged like they are in the SEB Configuration Tool for Windows and they are stored while modifying. This means, a entered value for an attribute is immediately sent to and stored by the SEB Server. There is no additional save action needed and no entered data will be lost. Instead the "Save / Publish Settings" can be used to store the current setting in a new revision in the history while also publish them to exams that uses this exam configuration.
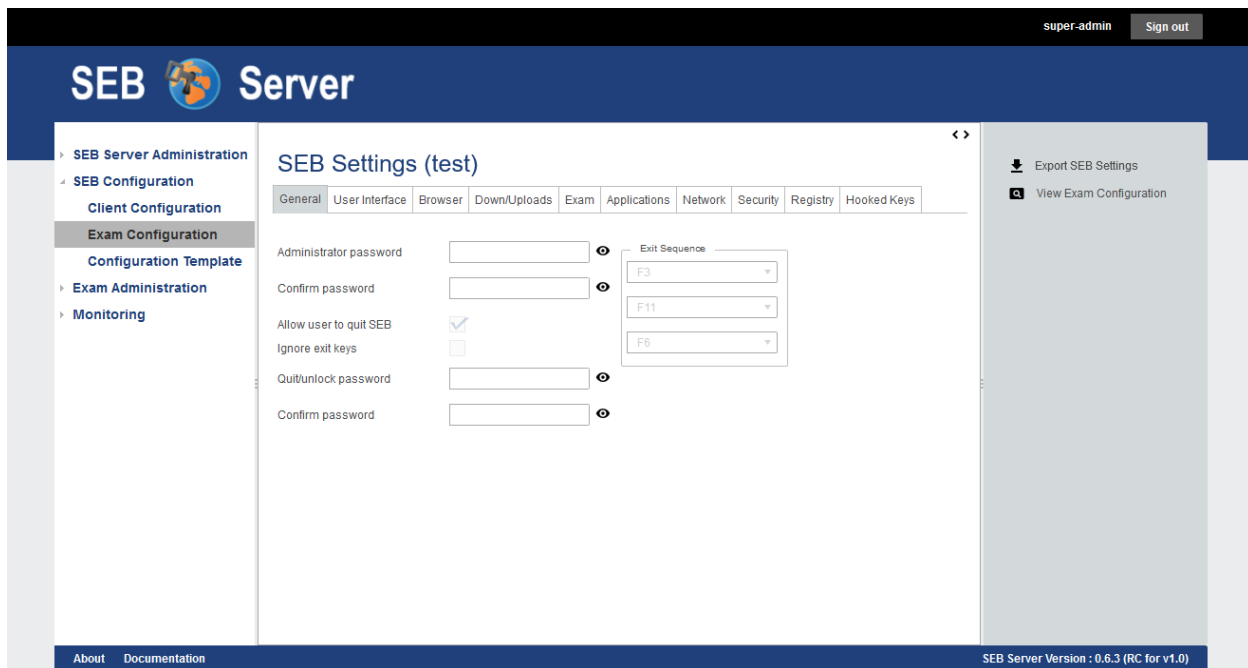
Note: Changes in SEB settings must be published to be available on exports, exams or other uses. Before publishing they are not available for exams and SEB clients that connect to the SEB Server will still receive the last published version of the SEB settings. To publish SEB setting changes use the "Save / Publish Settings" action from the right action pane.

Note: Currently there is an "Undo" function to revert the changed made to the last published state. But there is no possibility yet to maintain the publishing history of a Exam Configuration but may be available in a future release of the SEB Server.

Since an exam configuration can only be used by one exam it may be convenient to quickly copy an existing exam configuration that is in use and use the copy of this exam configuration for another exam or to just change the settings to make a slightly different exam configuration. The "Copy Exam Configuration" action can always be used no matter in what state the exam configuration may be at the moment. By using this feature there will be a copy dialog shown as pop-up window where one has to give at least a new unique name for the copy. See copy-config-label for detailed step by step guide.

A plain XML export of the SEB settings may be needed for testing. This is always possible by using the "Export SEB Settings" action from the right action pane in the SEB settings view. This will start a usual browser download dialog handled by your browser to save or load the file. The default name of the file of a exam configuration is "SEBExamSettings.seb".

SEB Server supports also the SEB Config-Key that is used to validate the SEB configuration on the LMS adds a higher security level to the exam. This supported if the specific type of LMS supports the automated SEB restriction feature. Anyways sometimes it may be needed to manually extract the SEB Config-Key for a exam configuration. Therefore one can use the "Export Client-Key" action from the right action pane to generate the Config-Key form the actual saved SEB settings revision of the exam configuration. The key will be presented by a pop-up dialog where it can be copied for further use.
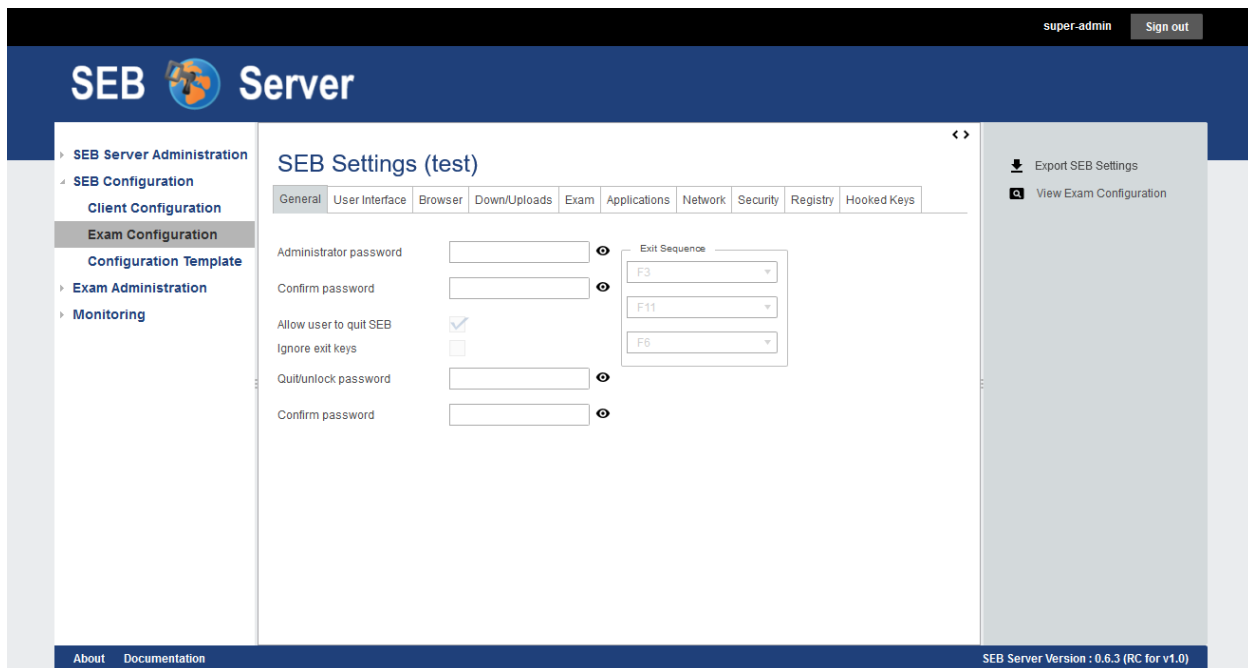
Use Cases

Create new Exam Configuration

For the upcoming semester you have to create several new exam configurations for the different kind of exams your institution is going to provide during the semester.

- Sign into SEB Server with your exam administrator role account

- Navigate to the "Exam Configuration" menu within the SEB Configuration section on the left hand side.

- You see a list of all available exam configuration.

- Use the "Add Exam Configuration" action on the action pane on the right hand side to create a new exam configuration

- The creation form at least needs a unique name for the exam configuration. You can also add a description or hint to recognize and find this configuration more easily later on.

- In the "Status" field you are able to choose if the configuration is still under construction and cannot be added to exams yet, or if it is ready to use.

- Save the form with the "Save Exam Configuration" action on the right action pane to create the configuration.

- After successfully saved the new exam configuration use "Edit SEB Settings" to open all the SEB settings that can be defined for a exam.

- For more information about the individual SEB settings see SEB Configuration.

- In the SEB settings view use the "Save / Publish Settings" action to save your settings.

Note: Changes in SEB settings are automatically sent to the server and stored within the open working revision of the settings. To make a open working revision active and available for export, exams and other uses, you need to save / publish this settings exclusively by using the "Save / Publish Settings" action. After using this action all the changes are saved in a historical revision and available for use. A new working revision will be created and all the changes

until then will go into the new working revision. To revert all the changes done since last save / publish use the "Undo" action.

Export SEB Settings

You want to test an exam configuration manually with a SEB client. Therefore you need to export the settings of an existing exam configuration and load it with a SEB client or the SEB configuration tool.

- Sign into SEB Server with your exam administrator role account

- Navigate to the "Exam Configuration" menu within the SEB Configuration section on the left hand side.

- You see a list of all available exam configuration.

- Use the Filter above the list to narrow down the number of entries and to find a specific exam configuration.

- Open the exam configuration either by double-click on the list entry or be selecting the list entry and using the "View Exam Configuration" action.

- Open the SEB settings of the exam configuration by using the action on the right action pane.

- Use the "Export SEB Settings" action to start the export download.

- Save the file or open it directly with SEB

Import an Exam Configuration

There is an existing SEB configuration file once created with the SEB config tool that must be imported to use with SEB Server. The SEB configuration files where created with the SEB configuration tool and are all saved with the purpose to start an exam (attribute).

- Sign into SEB Server with your exam administrator role account

- Navigate to the "Exam Configuration" menu within the SEB Configuration section on the left hand side.

- Use the "Import Exam Configuration" action from the right action pane to start an upload dialog.

- Within the upload dialog use the file selector to select the SEB configuration file for importing.

- Give a unique name for the imported exam configuration and a description (optional).

- If the original SEB configuration is password protected, give the password that is needed to decrypt the configuration file.

- Use the OK action on the upload dialog to start the import.

- If the import was successful a new exam configuration with the given name exists.

Copy an Exam Configuration

Since an exam configuration can only be used by one exam you have periodically to create a copy of an existing exam configuration that is already attached to an exam. The copy can then be used to either make first some changes to the settings or add it directly to another exam that has to be configured for SEB.

- Sign into SEB Server with your exam administrator role account

- Navigate to the "Exam Configuration" menu within the SEB Configuration section on the left hand side.

- You see a list of all available exam configuration.

- Use the Filter above the list to narrow down the number of entries and to find a specific exam configuration.

- Open the exam configuration either by double-click on the list entry or be selecting the list entry and using the "View Exam Configuration" action.

- Use the "Copy Exam Configuration" action from the right action pane to open up the copy dialog.

- Within the copy dialog give a new unique name for the new exam configuration and a description if needed.

- Use "With History" apply the whole history of the original exam configuration to be copied or let it unchecked to just copy the last saved / published revision of the original.

- If all information is correct, use the "OK" button of the copy dialog to create the copy.

Note: If there where changes in the working revision of the exam configuration to copy, they will not be included in the copy. Only saved / published changes are included in the copy.

Generate and Export the Config-Key of an Exam Configuration

Usually the SEB Config-Key that is used to validate the SEB configuration on the LMS is propagated automatically to a LMS by the SEB Server with the automated SEB restriction feature. But For testing purposes you need to generate and export the SEB Config-Key and set it manually on the LMS.

- Sign into SEB Server with your exam administrator role account

- Navigate to the "Exam Configuration" menu within the SEB Configuration section on the left hand side.

- You see a list of all available exam configuration.

- Use the Filter above the list to narrow down the number of entries and to find a specific exam configuration.

- Open the exam configuration either by double-click on the list entry or be selecting the list entry and using the "View Exam Configuration" action.

- Use the "Export Config-Key" action from the right action pane to generate the Config-Key and open a dialog that presents this generated Config-Key.

- Mark the Config-Key hash in the dialog with double-click and copy it (ctrl+c) to the clip-board.

Note: If there where changes in the working revision of the exam configuration to create the Config-Key from, they will not be included in the generation of the Config-Key. Only saved / published changes are included in the Config-Key generation.

Changing SEB Settings of an Exam Configuration in Use

There is an already fully configured exam within SEB Server that is currently running with a prepared exam configuration. You have now realized that some SEB settings are missing or wrong and has to be changed for the exam. This is possible but under some restrictions. See the note below.

Note: When a exam configuration is applied to a currently running exam, the exam configuration is in "Used" state and the SEB settings of the exam configuration are in read only mode. Changing the SEB settings of a exam configuration during a running exam that has already connected clients can lead to unexpected behavior. SEB clients that has already been connected and are in a running session will work with the old configuration while SEB clients that are connecting after a SEB settings change will work with the new configuration. Also the automated SEB restriction with the changed SEB Config-Key will be updated immediately after saving / publishing the configuration changes. This may also lead to unexpected behavior and eventually blocking of already connected SEB clients. Therefore SEB Server restricts the change of SEB settings for configurations that are attached to an exam that is currently running to be only possible if there are no active SEB client connections for this exam at the moment when save / publish the SEB setting changes.

- Sign into SEB Server with your exam administrator role account

- To change the SEB Settings of an exam configuration that is attached to an currently running exam, make sure that there are no active SEB client connections. Go to the "Monitoring" section and find and view the concerned exam to make sure there are currently no active SEB client connections.

- Navigate to the "Exam Configuration" menu within the SEB Configuration section on the left hand side.

- You see a list of all available exam configuration.

- Use the Filter above the list to narrow down the number of entries and to find a specific exam configuration.

- Open the exam configuration either by double-click on the list entry or be selecting the list entry and using the "View Exam Configuration" action.

- See that you currently are not able to edit the SEB settings. There is only a "View SEB Settings" action that opens the SEB settings in read-only mode.

- Use the "Edit Exam Configuration" action from the right action pane to open the edit mode of the exam configuration.

- Change the status from "Used" to "Under Construction" to be able to edit the SEB settings again. There will be a message that tells you the implication with changing SEB settings within a exam configuration that is already used by a running exam.

- After saving the exam configuration in "Under Construction" it is now possible to edit the SEB settings for this exam configuration.

- Use the "Edit SEB Settings" action from the right action pane to open the SEB settings form in the edit mode.

- Apply your changes to the settings and use "Save / Publish Settings" to make the settings take affect and trigger a configuration change to the exam. This will check first if there are currently no active SEB clients connected within the running exam that uses this exam configuration. If there is one or more active SEB client connected, the action will deny and inform you about the the active SEB clients.

SEB Setting Differences

In the current version of SEB Server, there are some differences to some SEB settings as well as some SEB settings that are slightly different or not available at all on the SEB Server.

SEB settings currently not supported by the SEB Server

- Start URL: Since SEB Server has already been contacted by a SEB client when downloading the exam configuration this is not used by the exam configuration on SEB Server. But this can be used as fallback URL in the Connection Configuration.

- Embedded Resource: There is currently no embedding supported within exam configurations on SEB Server.

- Additional Dictionaries: There are only the SEB client default dictionaries available in the current SEB Server version.

- Additional Resources: Additional resources are currently not available in the current SEB Server version.

- Embedded Certificates: There is currently no certificate management possible on current SEB Server version.

- Browser Exam Key: There is currently no possibility to generate the Browser Exam Key on the SEB Server. But an already generated Browser Exam Key may be used within the SEB restriction feature on the exam configuration if this feature is supported by the LMS in use.

SEB settings that has a slightly different form or handling in SEB Server comparing to the SEB configuration tool

- Download Directory OSX: Since it is not possible within a web-service to choose a local directory on a remote device this is just a text input where one has to give the full-path to the directory on the client device in text form.

- Log Directory OSX, Log Directory Win: Since it is not possible within a web-service to choose a local directory on a remote device this is just a text input where one has to give the full-path to the directory on the client device in text form.

- Permitted Processes / Executable: This is also just a text input field where one can give the name of the process in text form.

SEB settings from versions before 3.0 that are not supported anymore

- Permitted Processes / Window Handling Process

Exam Configuration Templates

With this feature you can create and manage templates for SEB exam configuration settings. You are able to mainly define default values for each SEB exam settings attribute for an exam config and you are also able to define whether the settings attribute shall be viewed on an exam configuration created from the template or if it shall be hidden.

Note: The exam configuration template feature is the most experimental feature in SEB Server for now and my change for the upcoming releases.

To view all available exam configuration templates go to the "SEB Configuration" section and click on the "Configuration Template" menu entry of the left menu pane. SEB Server will then present you a list of all available exam configuration templates. You can filter and sort the list as usual to find a specific template by name for example.

To create a new exam configuration template use the "Add Configuration Template" action from the right action pane. You will see the creation form with a name and description for the new template. At least a unique name is mandatory and the description is optional.
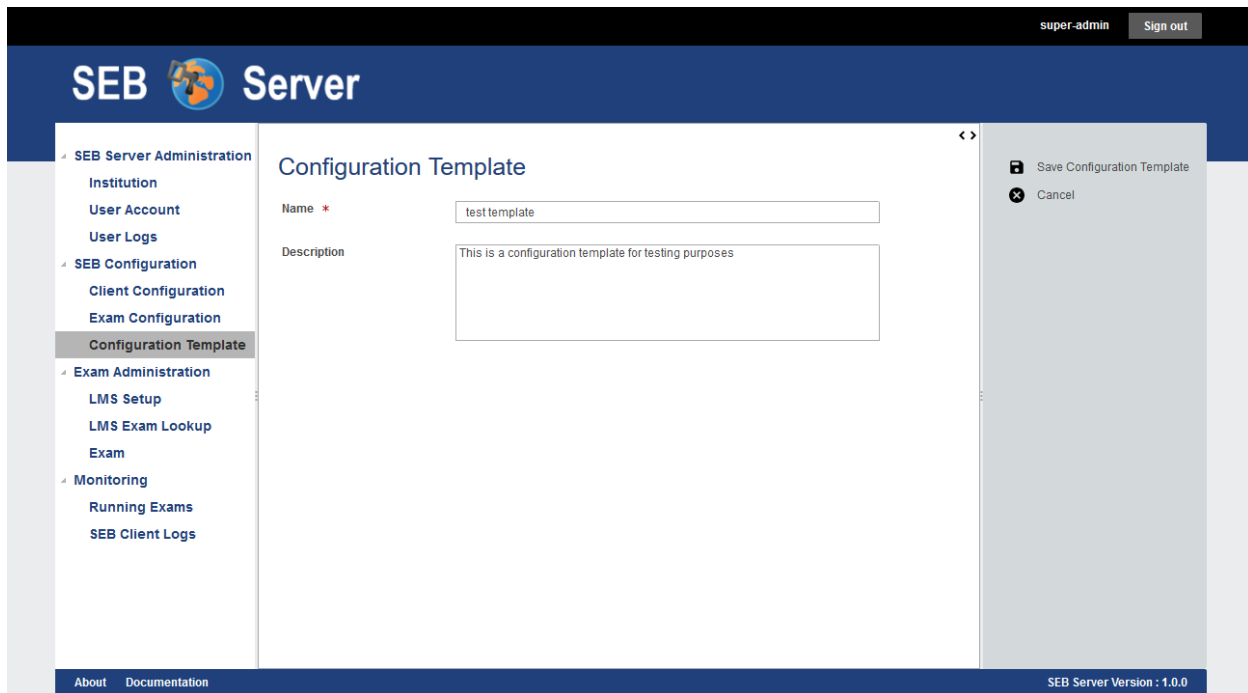
To create and save the new exam configuration template use the "Save Configuration Template" action from the right action pane. The template will be created with all default settings attribute and views and you will see the configuration template view page. In the view page you will see the information of the template within the page header following by a list of all exam configuration setting attributes available for a SEB exam configuration on the SEB Server. The name of an attribute is composed of the internal attribute name followed by the display name of the attribute.
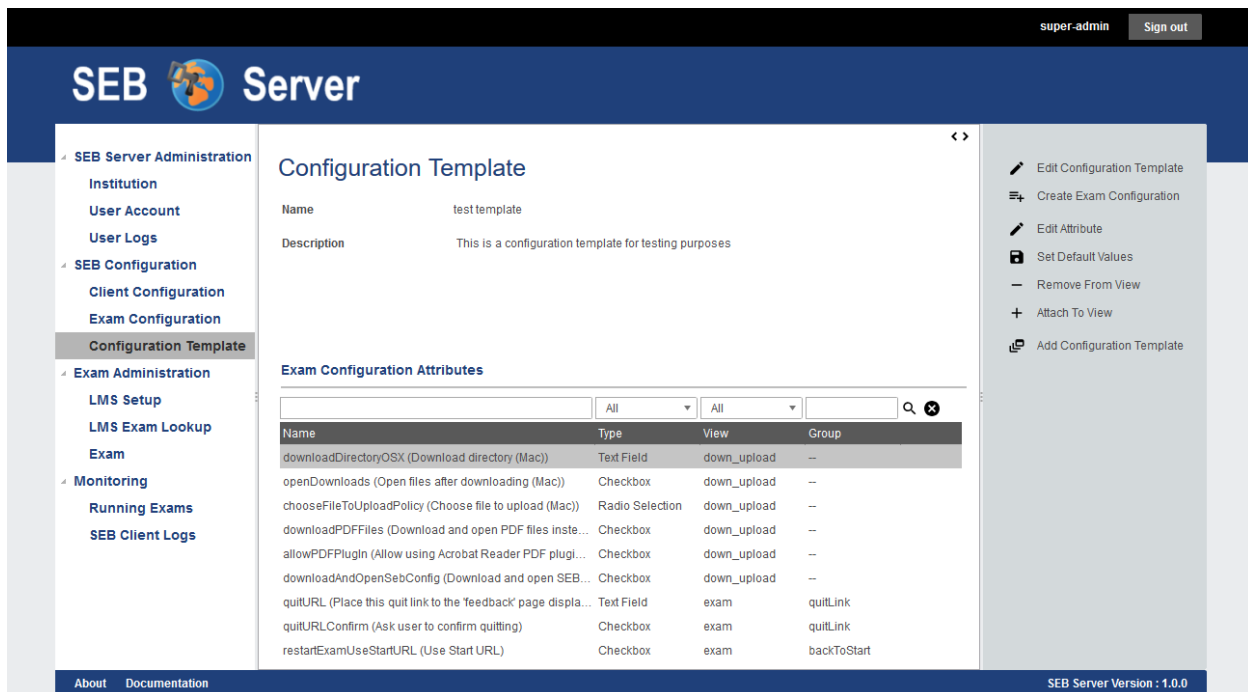
The type of the attribute defines the input field type and cannot be changed in any way. The view defines the the tab on which the settings attribute is placed. And the group defines the named group where a settings attribute belongs to.

Note: For now the "View" and "Group" properties of an settings attribute cannot be changed, just be set whether the settings attribute shall be shown on its defined view (tab) and within its defined position on the tab or if it shall be hidden at all. In a future version of SEB Server it may possible to also place a settings attribute to another "View" and/or "Group" and also to a certain position of the view grid.

To attach or detach a particular settings attribute for the template from the view to show or hide it in the configuration settings, select the specific settings attribute from the list and use either the "Remove From View" action when you want to remove an attached one, or the "Attach To View" action when you want to attach a hidden settings attribute to the default view.

To define a default value for a specific attribute, select the attribute from the list and use the "Edit Attribute" action from the right action pane to open the settings attribute in edit mode. Or just double click on the specific list entry of the settings attribute.

In the settings attribute edit page you see general information about the attribute on the upper part of the page and on the second part you see the input field if the settings attribute with the current default value set. To alter the default value just use the input field of the attribute to change the value and the change will automatically be set as new default value. If you want to reset the default value of the settings attribute to the original default value, use the "Set Default Values" action from the right action pane to do so. You are also able to attach or detach the settings attribute from the view here by using the "Remove From View" or "Attach To View" actions from the right action pane. To go back to the exam configuration template view use the "View Configuration Template" action from the right action pane.

Back in the exam configuration template view you are able to create a new SEB exam configuration directly from this template by using the "Create Exam Configuration" action from the right action pane. The application will present you a creation dialog within a pop-up where you can define a name and description for the new SEB exam configuration. At least a unique name is mandatory.
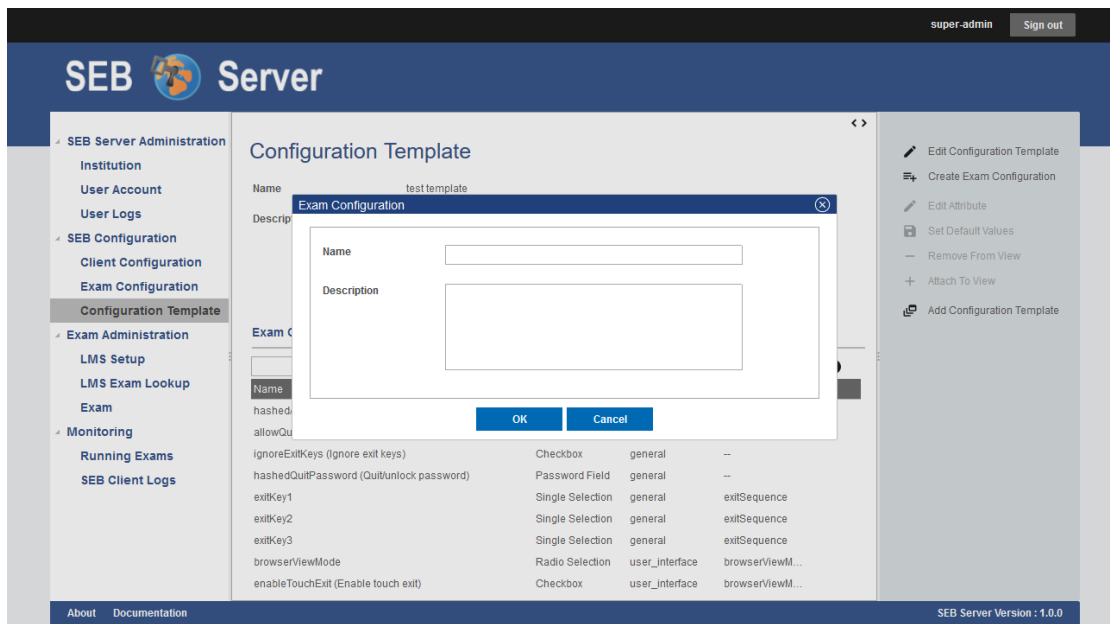
After defines a name and description for the new SEB exam configuration you can click on "OK" to do so an the application will show you the new created SEB exam configuration in the usual place.

Certificates

Overview

Import and store X.509 certificates within SEB Server is a new feature since SEB Server version 1.2. This allows an institutional administrator or an exam administrator to upload and store certificates for further use within SEB Server.

Note: Certificates uploaded to SEB Server are stored in a secured certificate-store that is stored within the data base rather then a usual file. The certificated store is password secured and only the binary data of the certificate store is places into the databease for securty reasons.

Once a certificate has been uploaded to SEB Server it can be used for various other features of SEB Server where a certificate is needed. One feature that also comes with the SEB Server version 1.2 is the ability to encrypt a connection configuration with a certificate that has the right purpose (Identity) to do so. If you need this feature already, please have a look at: *Connection Configuration* Other planed features are the import of certificate encrypted exam configurations as well as to embed certificates within a exam configuration to allow certificate pinning between SEB and LMS.

There is currently certificate upload support for two version of certificates:
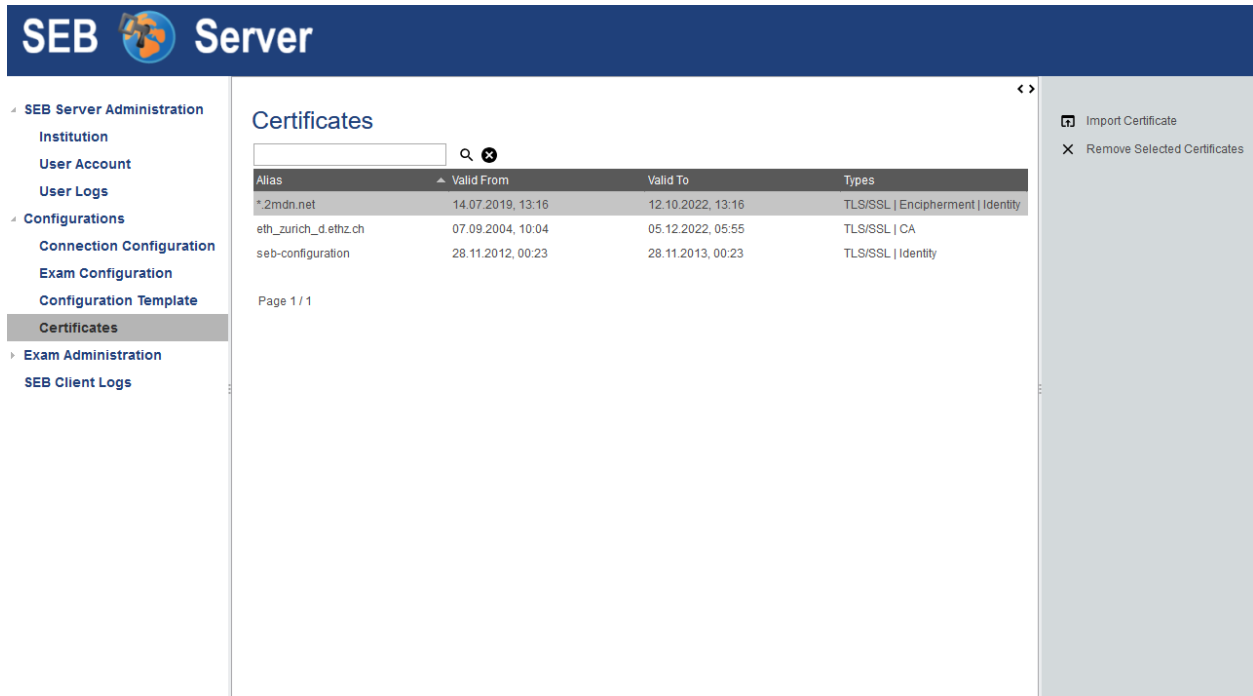
PEM

This are usually non password protected certificates in different file-formats. SEB Server currently supports the following PEM file-formats:

- .pem
- .crt
- .cer

PKCS12

This are usually password protected certificates in different file-formats. SEB Server currently supports the following PKCS12 file-formats:

- .p12

- .pfx

Use Cases

Upload a certificate

- To upload and store a certificate of supported file type, please open the "SEB Configuration" section and select the "Certificates" page

- You will see the list of known certificates from the SEB Server like in the picture above.

- Choose "Import Certificate" from the right action pane and the upload dialog will open.

- Within the upload dialog, select the certificate file on your local machine that you want to upload.

- If the certificate is password protected, you will need to give the password to upload the certificate.

- Chlick on "OK" to start the import.

- If the import is successful the imported certificate will show up in the list. Otherwise SEB Server will display an error message with the reason of failure.

Remove / delete a certificate

- To permanently delete a stored certificate on SEB Server, please open the "SEB Configuration" section and select the "Certificates" page

- You will see the list of known certificates from the SEB Server like in the picture above.

- Please select the certificate you want to remove.

- Choose "Remove Selected Certificates" from the right action pane and a configuration dialog will appear.

- If you are sure to delete the selected certificate(s), click on "OK" to delete.

- The deleted certificates disappear form the certificates list.

9.1.6 Exams

Within an exam in SEB server all threads come together to set up a e-assessment with Safe Exam Browser and SEB Server. An exam can be imported from a course that exists on an LMS that was binded with a LMS Setup. An exam configuration that was formerly created can be attached to the exam by choosing one from the library. Indicators can be defined that are shown in the monitoring section while monitoring a running exam. And if the API of the specified LMS integration supports individual SEB restriction attributes for a e-assessment, this can also be defined and managed on the exam management of SEB Server.

We will go through all the steps to setting up an exam for Safe Exam Browser with SEB Server one by one.

Import LMS Course as Exam in SEB Server

To be able to configure and manage a course or parts of a course existing on a LMS as an exam on SEB Server we first need to import an exam from the one of the available courses from a LMS that has been setup to use within the SEB Server.

Note: If you don't have already set up a LMS binding within SEB Server and your institution, you have to do this first. More information about setting up a LMS binding can be found in the chapter *Learning Management System Setup*

You will find the list of available courses provided form all LMS that are bound within your institution by going to the "Exam Administration" section on the left hand side and choosing "LMS Exam Lookup". The SEB Server will present you the list of all available courses and you are able to filter and sort the list as usual to find to right course for import.

Note: The "Start-Time" filter is usually set to the date one year before now or to some other default date in the past. The list shows only the courses that has a start-time after that time. If you have long running courses and it may possible that a course has been stated a year or two ago, you habe to adapt this "Start-Time" filter to view those courses that has been started before.

You can view more details of a course by double-click on the specific list entry or by selecting the list entry and click the "Show LMS Exam Details" action form the action pain on the right hand side. The application will open a pop-up with available detail information of the course.

To import a course as an exam find the specific course on the list by using the filter and select the list entry. Use the "Import As Exam" action from the action pane on the right hand side.

Note: If a course has already ended (End-Time passed) it is not possible to import this course and an appropriate message is shown.

On import, the application is creating an exam on SEB Server with a reference to the imported course on the LMS. All course specific data like name, description, start-, end-time and course-identifier will not be stored on the SEB Server but always be referenced by the underling course. This means, that the course data has to be modified on the LMS side as usual and the SEB Server always takes the actual data from the LMS for the course. This has the advantages of the principle of single responsibility and prevents synchronization issues.

You will see the creation page of the new exam with additional information:

- **Name**: Is the name of the course, defines on the LMS
- **LMS Setup**: Is the name of the LMS Setup on the SEB Server from which the course was imported
- **Start-Time**: Is the date and time when the exam is starting. This is defined on the LMS
- **End-Time**: Is the date and time when the exam ends. This is defined on the LMS
- **LMS Exam Identifier**: Is the identity of the course on the LMS (external identifier/primary key)
- **LMS Exam URL**: Is the start URL of the course/exam

You are now able to initially choose a type for the exam - "Exam Type" - that is currently only used for informational purpose and has no further restrictions or consequences on handling on in SEB Server.

Furthermore you can select and apply all exam supporter that shall be able to see and support this exam while running. To do so, click in the input field of the attribute "Exam Supporter" to see a drop down list of all available users for selection. To filter the drop down list, start typing characters of the name of the user-account you want to apply to automatically filter the list. Click on the drop-down list entry to select the specified user that will be added to the list below the input field. To add another user to the selection just click again into the input field and select another user. To remove a selected user from the selection-list, double-click on the specified entry of the selection-list.

Note: At least one user account must be selected for the attribute "Exam Supporter". You are able to change this also later on by editing the exam.

To confirm the import use the "Save Exam" action of the action pane on the right hand side or use "Cancel" if you want to abort the import of the exam and go back to the course list. If you have confirmed and successfully imported the exam, you will see the exam overview page where you are able to edit the details of the exam, apply SEB restrictions of supported by the LMS, apply a SEB exam configuration for the exam and define indicators for monitoring the exam later on.

How all this different aspects of the exam are defined and prepared is part of the next chapter.

Use Cases

Import a course as exam

To start setting up a course or quiz form an existing LMS as e-assessment with SEB and SEB Server you have to find this course or quiz on the SEB Server and import it as exam. Define a type and apply exam supporter.

- Login as an exam administrator and go to the "LMS Exam Lookup" page under the "Exam Administration" section.

- If you are not sure if the LMS that runs your course has already been setup within the SEB server, go first to the "LMS Setup" page and try to find the particular LMS in the list. If you can't find it, please contact an institutional administrator or setup the LMS by yourself as described in *Learning Management System Setup*.

- Find your course or quiz by using the filter of the list and the list navigation as usual.

- Double click on the list entries to get all information about a particular course or quiz.

- Once you have found the course or quiz, select it on the list and use the "Import Exam" action on the right action pane.

- The system will lead you to the exam import page where you see all the details of the course or quiz and where you can set a type and apply exam supporter before importing.

- Choose a type for the imported exam in the "Exam Type" selection. The type of an exam is currently just informative hand will cause no restriction for the imported exam.

- Select as many exam supporter as you want to be able to support the running exam. Read above, how to find and select exam supporter with the drop down multi selection.

- When all is properly set, use the "Save Exam" action on the right action pane to save the exam and complete the task.

Prepare Exam

This chapter is about setting up and prepare a already imported exam on SEB Server. If you don't have imported a course or quiz from LMS as an exam into SEB Server, please see the previous chapter for detailed guidance about hot to import an exam.

To find a specific exam that has already been imported, go to "Exam Administration" / "Exam" on the navigation menu on the left hand side to see a list of all available exams. You are able to filter and sort the list as usual to find to right course for import.

Note: The "Start-Time" filter is usually set to the date one year before now or to some other default date in the past. The list shows only the courses that has a start-time after that time. If you have long running courses and it may possible that a course has been stated a year or two ago, you habe to adapt this "Start-Time" filter to view those courses that has been started before.

Double click on the list entry of the exam or select the list entry and use the "View Exam" action of the action pain on the right hand side to open the exam in the detail view. Within the detail view of the exam you are able to edit the exam attribute, apply SEB exam configuration and indicators for monitoring as well as defining details of the SEB restriction if this feature is available from the LMS.

Note: If an exam is already running but is missing some essential setup, this is noted by the system. In the exam detail view the system displays a red framed message on the top of the page that points out the missing configuration parts. A running exam with missing setup is also marked red in the lists to indicate that they are not ready to go and need some missing setup or preparation.

At the beginning of the page - if there is no note - you see all the details of the exam.

- **Name**: Is the name of the course, defines on the LMS

- **LMS Setup**: Is the name of the LMS Setup on the SEB Server from which the course was imported

- **Start-Time**: Is the date and time when the exam is starting. This is defined on the LMS

- **End-Time**: Is the date and time when the exam ends. This is defined on the LMS

- **LMS Exam Identifier**: Is the identity of the course on the LMS (external identifier/primary key)

- **LMS Exam URL**: Is the start URL of the course/exam

To edit the SEB Server relevant attributes you can use the "Edit Exam" action from the action pain on the right hand side to switch to the exam edit mode. In the exam edit mode you can modify the type of the exam "Exam Type". The exam type has currently only informational character and has no implication on SEB Server side but may be used in the future to apply to different exam scenarios for SEB Server and SEB. Here you can also manage the accounts that shall be able to support and monitor the exam. To do so, use the multi combo selection within the "Exam Supporter" attribute. Click in the input field of the attribute "Exam Supporter" to see a drop down list of all available users for selection. To filter the drop down list, start typing characters of the name of the user-account you want to apply to automatically filter the list. Click on the drop-down list entry to select the specified user that will be added to the list below the input field. To add another user to the selection just click again into the input field and select another user. To remove a selected user from the selection-list, double-click on the specified entry of the selection-list.

Apply SEB Exam Configuration

Just below the exam details you will find the list of applied SEB exam configurations. Currently the number of SEB exam configurations that can be applied to an exam is restricted to one since it is not yet possible to apply a SEB exam configuration not just to the exam but also to a specific user or a specific group of users. This feature may come with a future release of seb server. But for now you are able to apply just one SEB exam configuration to the exam and this configuration gets delivered to all the SEB clients that connect to the SEB server and participate to the exam.

To apply a SEB exam configuration to an exam use the "Add Exam Configuration" action on the right action pane. A pop-up will prompt you to select an SEB exam configuration by a drop-down selection. The drop-down box will present you all SEB exam configurations that are in state "Ready To Use" and that are not already used by another exam. If there are more SEB exam configurations in the selection as fitting into the drop-down box, you can either scroll the content of the drop-down box or start typing the name of SEB exam configuration to filter the list. After selecting a SEB exam configuration, the pop-up shows the description and the status of the selected configuration.

Note: If there are no SEB exam configurations available for applying, the application will note this within a pop-up message. In this case you can create a new one for this exam as described in *Automated SEB Restriction*
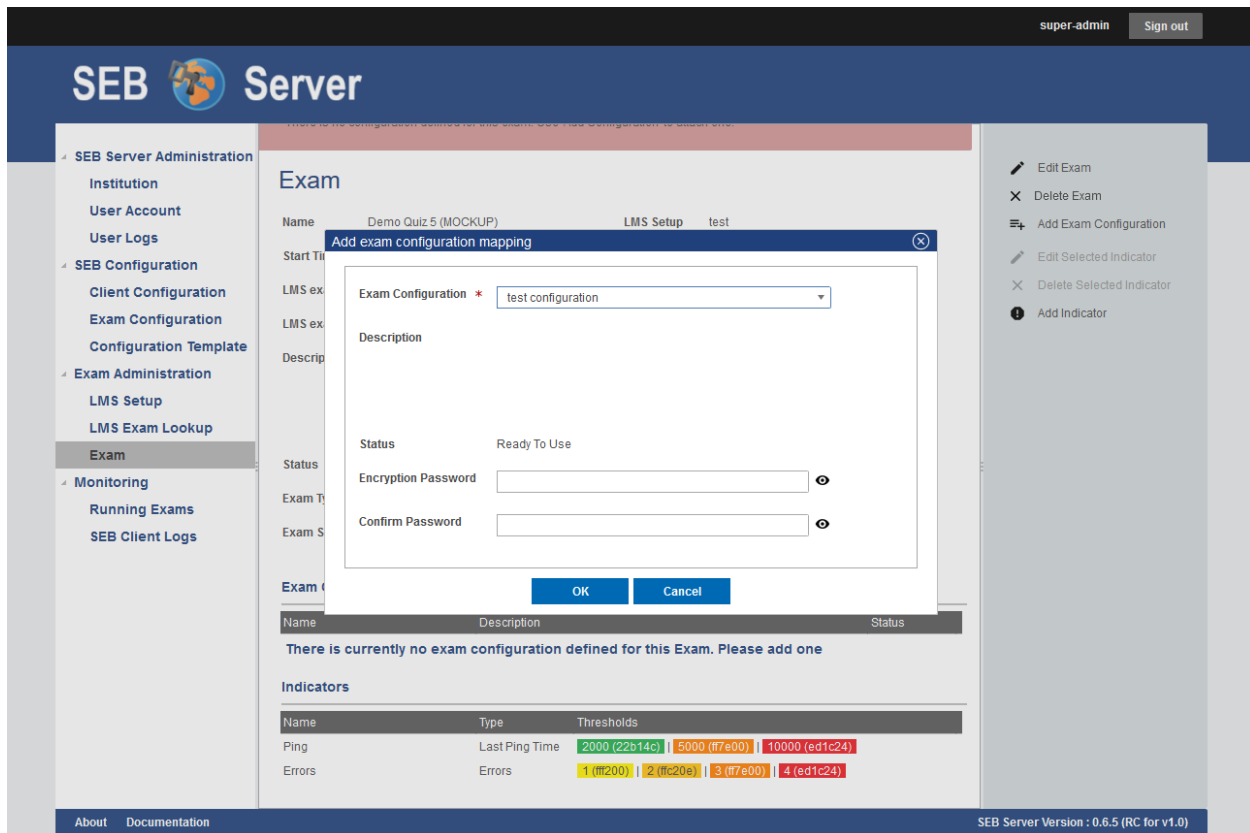
There is also the possibility to encrypt the SEB exam configuration by a password. This is done before the SEB configuration is send to a connecting SEB client. Since in the moste cases the SEB client connections are over HTTPS / TSL there is alrady a good protection in place and an additional encryption of the SEB exam configuration is not recommended. Anyways, if you decide the use the additional password encryption, the SEB client that receives the encrypted SEB exam configuration will prompt the user for the password to proceed and connect to the LMS.

Note: If you need to use the same SEB exam configuration for different exams, you can just make a copy of a SEB exam configuration that is already used by another exam. - To do so go the the "Exam Configuration" section and find the specified SEB exam configuration by using the filter. If you have found the SEB exam configuration double-click on the table entry to open the SEB exam configuration. Then use the "Copy Exam Configuration" action from the right action pane. A pop-up will prompt you the give a new name and optionally description for the copy. Click "OK" and the system will generate a copy of the original SEB exam configuration with the new name and description and will lead you to the details page of the copy configuration.

Click the "OK" button on the pop-up to apply the selected SEB exam configuration. You will see the applied SEB exam configuration in the list. If the automated SEB restriction feature is supported by the LMS of the exam, the application of a SEB exam configuration will automatically update the SEB restriction details with the generated Config-Key. See *Automated SEB Restriction* for more information.

When a SEB exam configuration is applied to the exam you are able to export the SEB exam configuration XML in plain text or the generated Config-Key for testing purposes. Just select the SEB exam configuration in the list to activate the action on the action pain on the right side and use the appropriate action. The SEB exam configuration export action will instruct the browser to open a download dialog. How the download is applied is up the the browser of use. Usually you are able to either save the file or open it up with a application. If you have already installed the Safe Exam Browser on your device, the browser probably associates the download file already with the SEB client application.

To just generate the Config-Key for testing purposes or to manually apply it on an LMS without the automated SEB restriction feature you can use the "Export Config-Key" action to generate the key. The Config-Key is presented by a pop-up and can be selected and copied to the clip-board. For more information about the Config-Key its purpose and use, please visit the SEB documentation.

To remove an already applied SEB exam configuration from the exam, select the SEB exam configuration in the table and use the "Delete Exam Configuration" action form the right action pane. If the automated SEB restriction feature is supported by the LMS of the exam, the removal of a SEB exam configuration will automatically update the SEB restriction details and remove the Config-Key form the restriction details. See *Automated SEB Restriction* for more information. Once you have removed a SEB exam configuration from the exam you are able to apply another one to the exam.

You can navigate directly to the SEB exam configuration details page by double-click on the table entry of the SEB exam configuration. You will then see the details of the SEB exam configuration as well as a table of exams where this SEB exam configuration is used. Since for now it is only possible to apply one SEB exam configuration to one exam, there is only one entry and you can quickly navigate back to the exam be also double-click on the table entry of the exam.

Use Cases

Apply or remove exam supporter

Exam supporter "Eric" was planed to support the upcoming exam but he cancelled for reasons of illness and exam supporter "Anie" will take over. Therefore you have to remove Eric from the exams supporter list while also adding Anie to the list. So she will be able to support the running exam.

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- Use the "Edit Exam" action form the right action pane to go into the exam edit page.

- Find Eric's user account on the list of selected exam supporter and use the minus sign icon on the entry to remove Eric from the list of exam supporter

- Click into the input field of the exam supporter selector and start typing the name of Anie's account. The drop down will present you all matching entries. Select Anie's account to add it to the list of selected exam supporter.

- Use the "Save Exam" action on the right action pane to save and confirm the task. This will lead you also back to the exam details page.

- Check again if all exam supporter are correctly assigned for the exam.

Change the type of exam

Although the exam type has just informative character for now and did not affect the exam in any other way, you have to change the type because your institution use the type information of the exam to set them into context.

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- Use the "Edit Exam" action form the right action pane to go into the exam edit page.

- Use the drop down selection to change the type of the exam.

- Use the "Save Exam" action on the right action pane to save and confirm the task. This will lead you also back to the exam details page.

Apply a SEB exam configuration

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- If the exam has already one exam configuration attached you have first to delete this attachment before being able to attach another exam configuration. Use the "Delete Configuration" action from the right action pane to remove the attached exam configuration.

- Use the "Add Exam Configuration" action form the right action pane to open up the attachment dialog.

- If there is currently no exam configuration that can be attached to the exam, an information dialog will be shown instead of the attachment dialog.

- On the attachment dialog use the drop down selection to select the exam configuration you want to apply to the exam. The drop down selection shows the names of the available exam configurations and you can filter this names by start typing the name of the exam configuration you want to find in the input field of the selection.

- When you have selected a exam configuration the dialog shows you some additional information about the exam configuration.

- If you want or need to put an password protected encryption to the exam configuration for this exam you can do so by give the password for the encryption also within the attachment dialog. Be aware that every SEB client that will receive an encrypted exam configuration from the SEB Server will prompt the user to give the correct password. In most cases an encryption of the exam configuration is not needed, because a secure HTTPS connection form SEB client to SEB Server is already in place.

Delete an exam

If you have "Exam Administrator" privileges you are able to entirely delete an existing exam and its dependencies.

Note: Please be aware that deletion in this context means a fully removal of the data. The data will be lost and not recoverable.

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.
- Use the filter to find the exam on that you have to delete.
- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.
- Use the "Delete" action on the right action pane to open a deletion dialog.
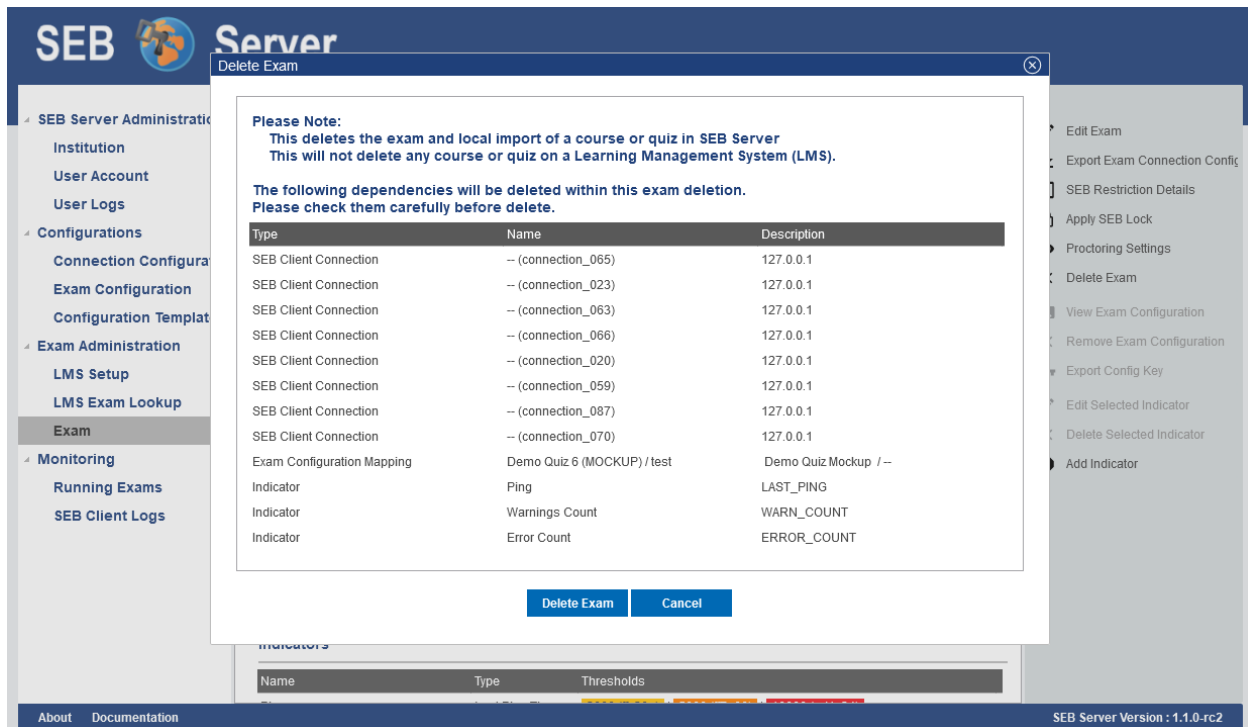
- Within the delete exam dialog you see a list of a dependencies that also will be deleted. Please check them carefully before deletion.
- Use the below action to either delete the exam or cancel the action and go back to the exam view.

Monitoring Indicators

For monitoring connected SEB clients, SEB server supports some indicators that can be defined within an exam and that are shown and measured during an exam. When you import, the application automatically creates a default ping-indicator for the exam. You are able to modify this default indicator and also add some other indicators to the exam to be able to get notified while monitoring a exam session.

The type of indicators are pre-defined within the SEB Server and restricts the number of available indicators that can be used. Currently following indicators are supported:

- **Last Ping Time: This indicator measures the time that has passed since the last ping from a specified SEB client was receiv**
  This can be used to monitor constant SEB client connections and get notified when a SEB client connection gets lost for some defined time or when a SEB client connection that has been list is back again. This

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indicator is used as default indicator and automatically applied to the exam on import. You are able to modify this indicator and also delete it but we recommend to have this basic indicator in place for every exam.

- **Errors**: This indicator measures the number of error-logs a specified SEB client is sending to the SEB Server.

- **Warnings**: This indicator measures the number of warning-logs a specified SEB client is sending to the SEB Server.

You can define thresholds for each indicator. A threshold is defined by an indication-color and by a threshold-value. On the monitoring side, the indicator for each SEB client connection with change to the threshold color when the measured indicator value has reached the threshold-value.

To add a new indicator to the exam you can use the "Add Indicator" action from the right action pane. In the indicator edit page you are able to give the new indicator a name. This name will be displayed in the SEB client connection table on monitoring section as column name for the column of this indicator. Then you are able to choose a "Type" that specifies the type of indicator. Choose this from a drop-down selection of supported indicators. If you have selected one indicator type, a description will be shown just below the "Type" attribute.

You can define a "Default Color" for the indicator. An indicator which measured value has not reached any defines threshold will be shown in this color on the SEB client connection table of the monitoring section.

Note: To select a color click on the brush-palette icon of the color input field to open up a color chooser pop-up window. Within the color chooser you can select one of the basic colors provided by the chooser or by defining the red, green and blue part of the color.

Below the default color you see a list of thresholds. Use the plus sign icon to add a new threshold to the list and on an existing threshold use the minus sign icon to remove a particular threshold form the list. A threshold has a threshold-value and a threshold-color. The threshold value must be set in the format of the measured indicator value that is described within the type description. This is usually an integer or floating-point number. The color for each threshold can be set using the color chooser tool by clicking on the brush-palette icon on the right side of each threshold. The color chooser pop-up is the same as for the default color.

Note: In the monitoring section when the exam is running, an indicator will be shown within a column with given name of the indicator in the SEB connection table. For each connection the measured indicator value will be displayed

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in the cell of the individual SEB client connection rows. If the measured indicator value for a particular SEB client reaches a defined threshold, the cell will be displayed in the defined color of the threshold.

Use Cases

Add an indicator

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- Use the "Add Indicator" action from the right action pane to create a new indicator. This will lead you to the indicator edit page.

- Set a name for the indicator and choose the type of indicator you want to use. Read the description above to learn more about indicators and supported types of indicators.

- You can also define a default color for the indicator that is displayed on the monitoring page while the exam is running and a particular SEB client has no incidence as defined for this indicator.

- To select a color use the brush-palette icon on the right side of the color input field to open up a color chooser dialog.

- Now you can define some threshold for the indicator that will help you find incidents and get informed about on the monitoring while the exam is running. To do so you can use the plus icon on the threshold list to add a new empty threshold to the list. You can choose a value for the threshold and a color that would indicate an overflow of the given value from the measured value of the indicator.

- To remove a already defined threshold from the list of threshold, use the minus icon on the right side of the particular threshold.

- When everything is set up properly use the "Save Indicator" action to save the indicator and go back to the exam details page.

- Back in the exam details page, you can check if your indicator is in the list and all thresholds are correctly set by going down to the indicators list of the exam.

Modify indicators

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- Scroll down to the indicator section of the exam details page and find the indicator you want to modify.

- Double click on the indicator entry from the list to open the indicator edit page.

- In the indicator edit page modify the indicator for your new needs. Add / remove thresholds or change the name or type of the indicator.

- To confirm your changes and save the indicator, use the "Save Indicator" action from the right action pane.

Delete an indicator

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- Scroll down to the indicator section of the exam details page and find the indicator you want to delete.

- Select the indicator from the list ans use the "Delete Indicator" action from the right action pane to delete the indicator.

Automated SEB Restriction

If the corresponding LMS of an exam supports the automated SEB restriction feature, the SEB restriction can be managed within the exam details page. To navigate to the exam details page of an exam go to the "Exam" page under the "Exam Administration", find the specified exam in the list by using the list filter and double click on the list entry of the exam you want to open the details page.

In the exam details page you will see two action related to the SEB restriction feature on the right action pane.

Use the "Apply SEB Lock" on an exam that has not already locked the course for SEB on the LMS to do apply the restriction and lock the course or quiz for SEB access only. This will call the SEB course restriction API on the LMS and will send all information to lock the course on the LMS. On an exam where the restriction lock is already in place, use the "Release SEB Lock" action to remove the restriction in the LMS and unlock the course.

Note: If the exam is already running on import the system will automatically restrict the course on the LMS with the available restriction details.

Use the "SEB Restriction Details" action to open up a dialog to define all SEB restriction details that the LMS of the exam and its SEB course restriction API is supporting. There are two global restriction details that are SEB specific and should be supported by every LMS that serves a course restriction API for SEB. The Config Key and the Browser Exam Key. The Config Key is automatically generated by the exam configuration that is applied to the exam. And the Browser Exam Key can be applied within a comma separated list if needed.
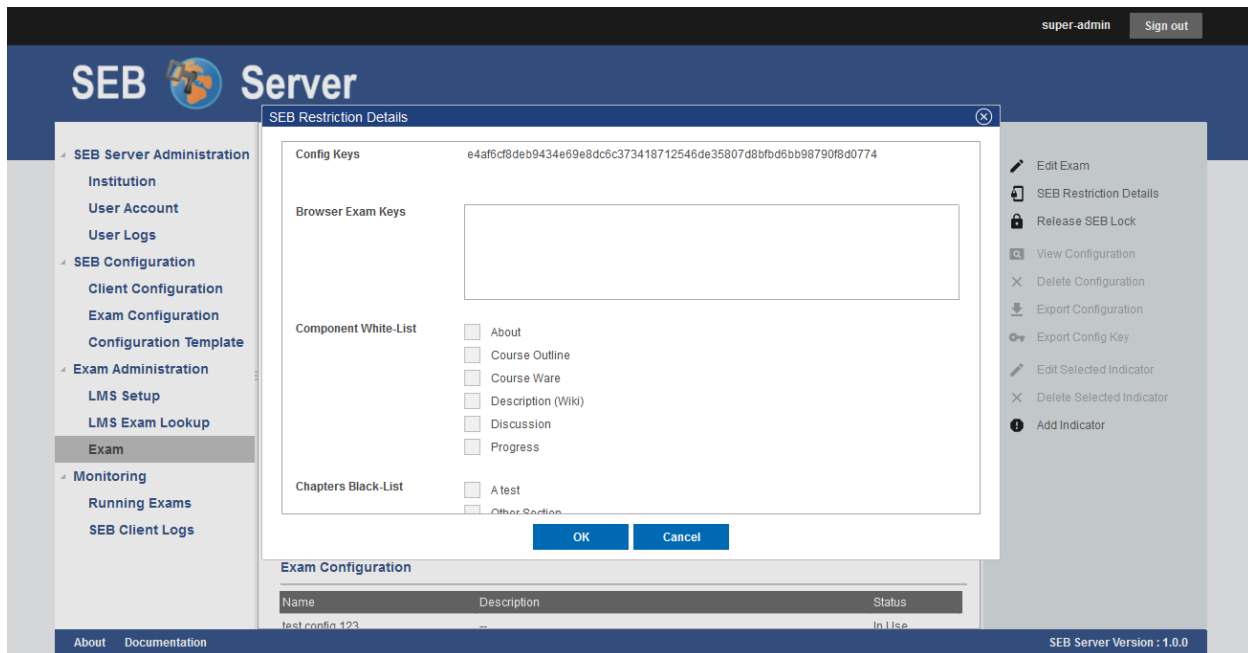
SEB restriction on Open edX

To be able to use the SEB restriction feature with a Open edX LMS, you need to install the SEB Open edX plugin from eduNEXT. Please consult the documentation for installing the SEB Open edX plugin as well as for the use of all additional supported restriction attributes.

Note: If you change the attached exam configuration either by changing the attachment or by changing the attributes of a attached exam configuration for an exam that has the SEB restriction in place, the Config Key generated from the exam config that is also changing, will automatically be updated on the LMS. Therefore such an action that triggers an update may take some more time to complete as when the restriction is not in place.

Use Cases

Modify SEB restriction details (Open edX)

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.
- Use the filter to find the exam on that you have to change the supporter assignments.
- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.
- Use the "SEB Restriction Details" action from the right action pane to open the restriction details dialog.
- In the restriction details dialog you will see all supported restriction attributes and you can define the restriction for your needs.
- To apply the new restriction details use the "OK" action of the dialog or use the "Cancel" action to abort and close the dialog.
- When the SEB restriction is active on the LMS, the system will automatically update the SEB restriction with the new details on the LMS.
- If the SEB restriction is not active in this moment, the details will be saved and applied when the restriction is activated.

Apply automated SEB restriction (Open edX)

- Login as an exam administrator and go to the "Exam" page under the "Exam Administration" section.

- Use the filter to find the exam on that you have to change the supporter assignments.

- Double click the list entry of the exam to go to the exam details page. Check if you are on the right exam.

- Use the "Apply SEB Lock" action from the right action pane to activate the SEB restriction lock for this course on the LMS.

- Use the "Release SEB Lock" action from the right action pane to deactivate the SEB restriction lock for this course on the LMS.

Note: If a SEB restriction lock is active on the LMS, every change on the exam or related components that will affect a change on the restriction details will automatically be updated on the LMS. You don't have to apply the SEB restriction lock again for update.

Live Proctoring

Live proctoring is a new and yet experimental feature of SEB and SEB Server. The main goal of the live proctoring feature is to support the integration of an external meeting service like Jitsi Meet or Zoom for example, within a SEB and SEB Server setup for an exam. In this scenario a SEB client is able to join a meeting and send audio and video data to the meeting where a proctor can watch the students during an exam within this meeting(s). The role of SEB Server in this scenario is mainly to bind a particular meeting service and automatically create meeting rooms, instruct connected SEB clients to join a certain meeting room. SEB Server can also instruct SEB clients to participate in the meeting by allowing connected SEB clients to receive audio and video as well as enabling chat functionality.

Note: This feature is still in a prototype state and not all functionality might work as expected. Basically the meeting features are given or restricted by the meeting service that is used and the API and GUI that is given by that meeting service client

To be able to use the integrated live proctoring feature with SEB and SEB Server you need an external meeting service that can be used by the SEB Server to automatically create meetings. If this feature is enabled, you are able to setup a live proctoring service for a specified exam that can be used in the monitoring later on while the exam is running and SEB clients are connected.

Currently supported meeting services are: - Jitsi Meet with JWT token authentication enabled. - Zoom meeting service with an account plan that fits your need and supports the Zoom API and Client SDKs.

To bind and setup a live proctoring service in SEB Server for an exam, go to the view page of the exam and use the "Proctoring Settings" action on the right action pain to open up the proctoring settings dialog.
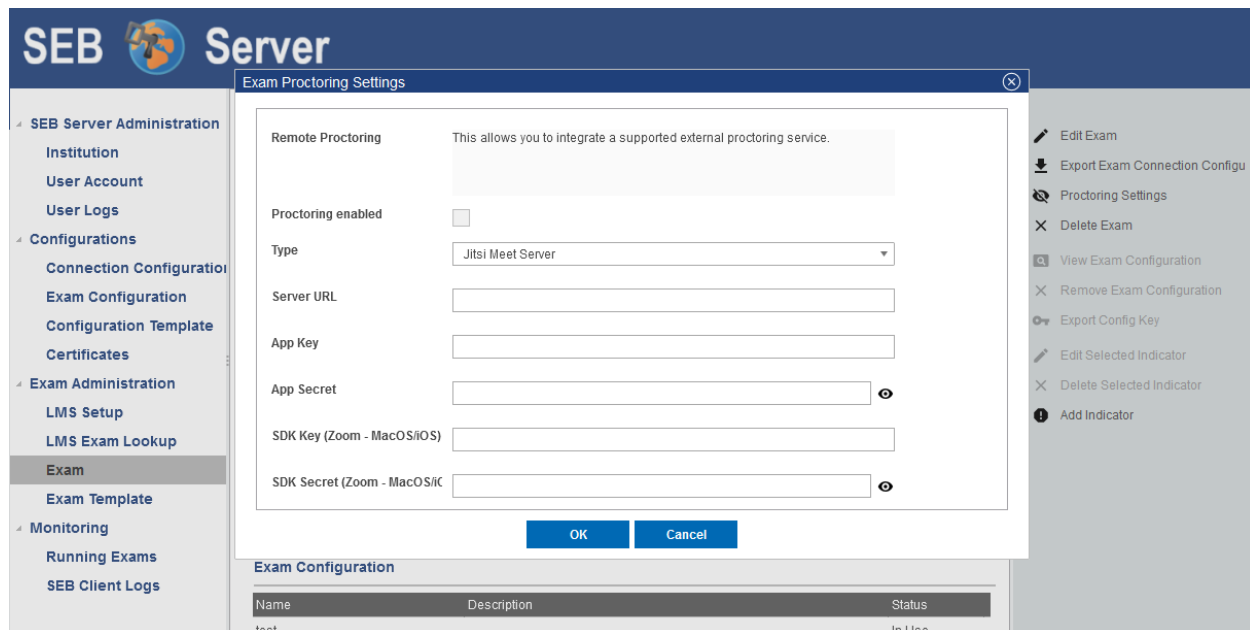
Within the proctoring settings dialog you are able switch the service on and off by using the "Proctoring enabled" checkbox. You also see if the proctoring service is enabled within the action icon that is either an eye when active or a slashed eye when not active. To define and bind a service you have to chose a service type from the available service types. And you need to give the API access credentials like "Application Key" and "Secret" for the external meeting service. SEB Server will then try to connect to the meeting service with these credentials to automatically create meetings/rooms for proctoring. Within the "Collecting Room Size" field you can define the number of maximal participants that shall be collected within one proctoring room. SEB Server will automatically create these collecting rooms while SEB clients are connecting to the running exam in the monitoring view.

Note: If you choose Zoom as your proctoring service and you also want to conduct your exam with Mac and/or iOS SEB Clients you will also need a Zoom SDK-Key and -Secret since SEB Mac/iOS uses Zoom SDK for proctoring integration.

Scroll down the Proctoring Settings window to see more settings for SEB Server based proctoring features:
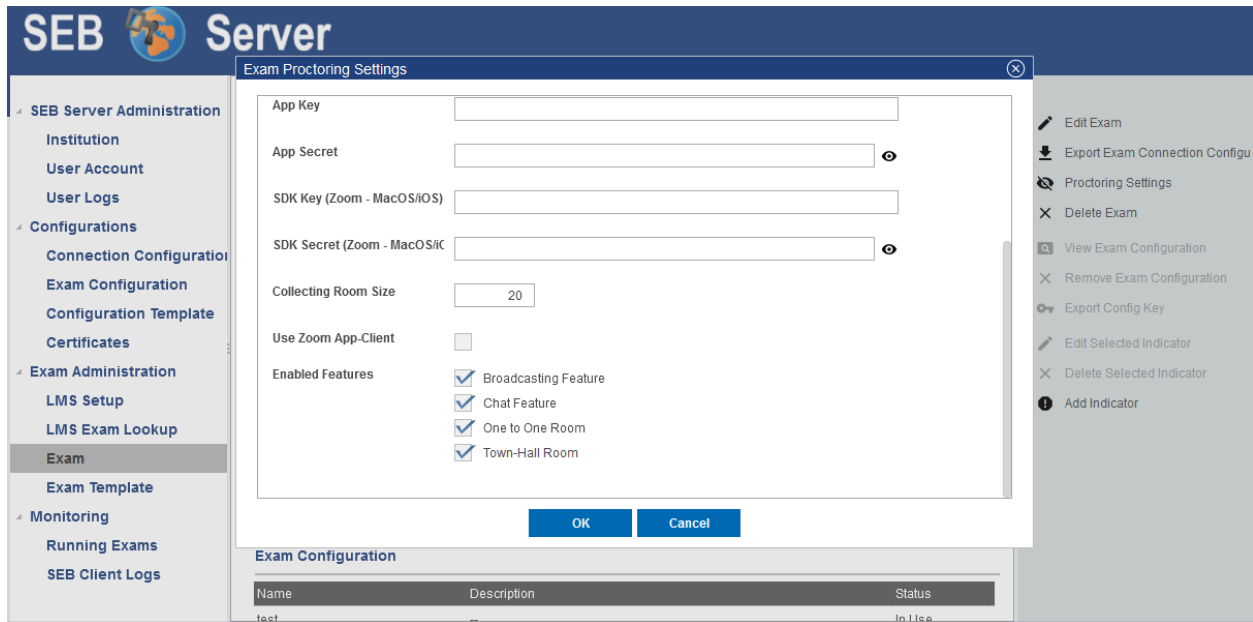
- Use Zoom App-Client: Enable this setting to use a Zoom App/Desktop client for the origin proctoring room. This needs an existing Zoom Desktop App installation on the proctor's desktop.

- Broadcasting Feature: Enable this to see the broadcasting features buttons in the opened proctoring windows. E.g. "Enable/Disable Audio" and "Enable/Disable Video" buttons.

- Chat Feature: Enable this to see the "Enable/Disable Chat" feature buttons in the opened proctoring windows.

- One to One Room: Enable this to see the One to One Room feature button during an exam monitoring within a SEB Client detail view

- Town-Hall Room: Enable this to see the Town-Hall Room feature button in the exam monitoring view

To read more about this proctoring features, please have a look at Exam Monitoring.

After you have all the settings done, use "OK" to confirm the settings. SEB Server will then try to connect to the meeting service with the given settings and check the access.

Note: Once a proctoring service is integrated for an exam, it is currently not possible to switch it to another service anymore. This is because different services needs different meeting reference data on SEB Server and there is no conversion supported. In the future we will make it possible to at least delete a already existing proctoring setup and to start from scratch.

The SEB client settings for proctoring can be found in the "Exam Configuration" "SEB Settings". There is a new tab with the name "Proctoring" where all SEB settings for proctoring are available. These settings are directly used by a SEB client that supports the proctoring feature. SEB will initialize with this settings when connecting to SEB Server and also will use this settings as default settings during an exam.
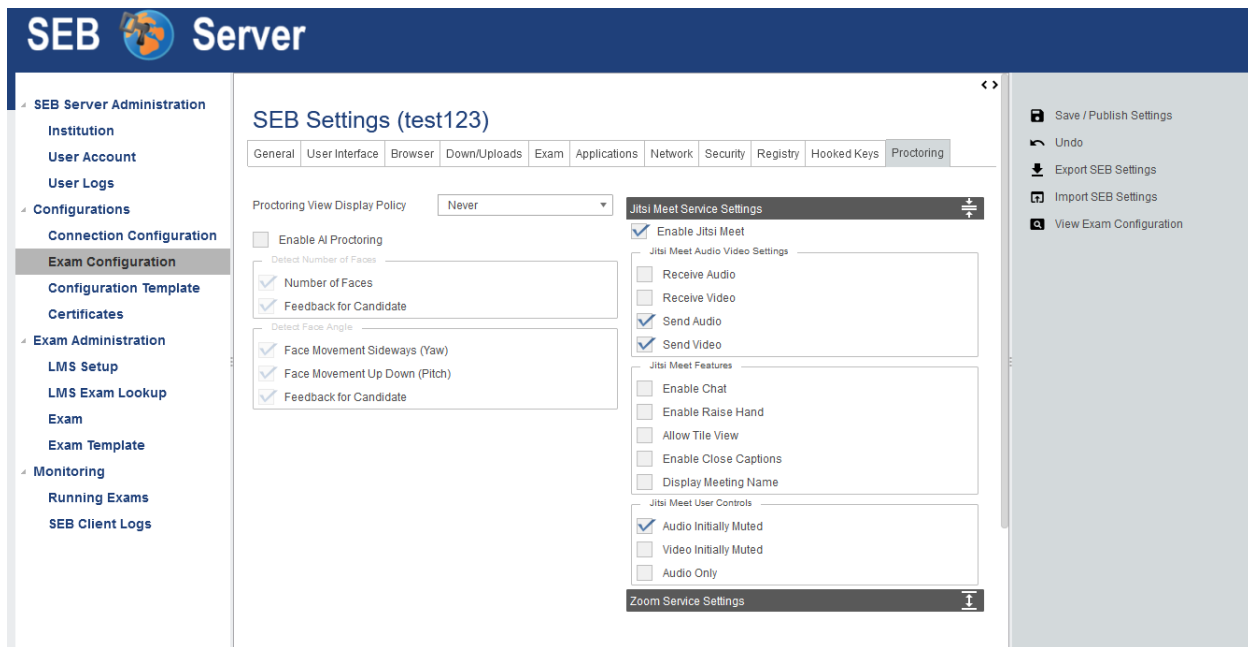
Since SEB Server version 1.2 there is also an Zoom service section that let you define the default SEB settings for a Zoom proctoring setup. Please be aware that not all of the settings are functioning yet. Please refer to the the settings tool-tip to get a actual description of a particular SEB feature setting

Jitsi Meet

To setup and configure a Jitsi Meet service for testing you can refer to the Docker installation documentation

Note: The Jitsi Meet integration works only with JWT authentication. Please refer to the above documentation for how to setup JWT authentication.

Zoom

To integrate Zoom meetings as a live proctoring service within SEB Server you need to have an appropriate Zoom account with API and SDK access. Zoom API and Client SDKs. Then you need to setup the Zoom account to run with JWT apps as described:

- Login into your Zoom account and use "App Marketplace" to setup an API app account
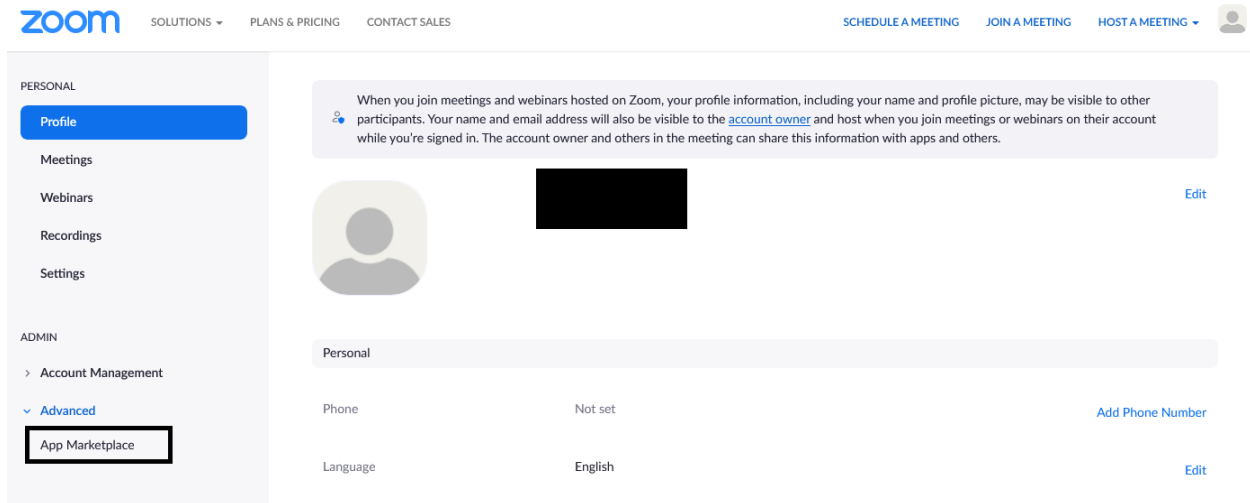
- Within the Zoom Marketplace use "Develop" and select "Build App".
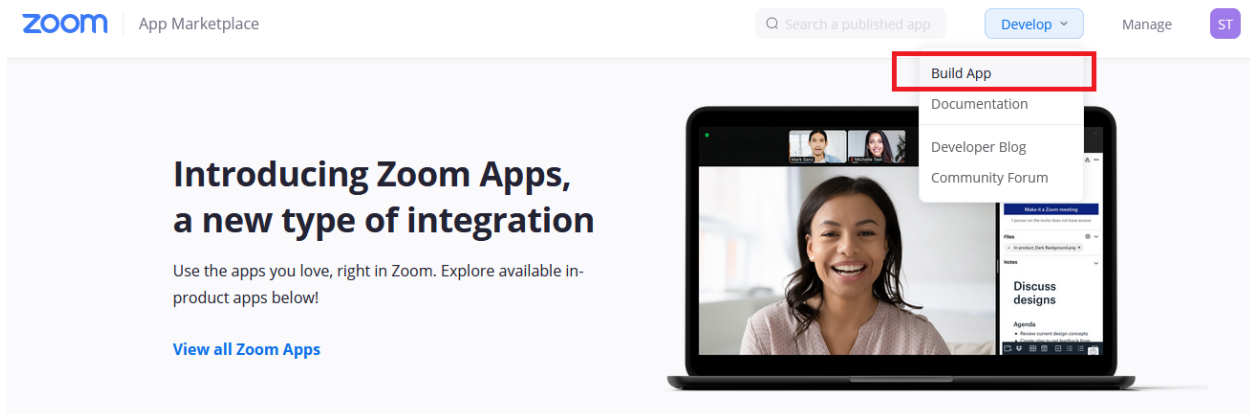
- Choose either JWT or SDK or both if needed for exams with different SEB clients

- Follow the instructions to create the API account and use the "App Key" and "App Secret" or SDK Key and SDK Secret within the setup in SEB Server

Exam Template

Overview

Exam templates are a new, useful feature available since SEB Server version 1.3. Within exam templates it is possible to create specific named templates that can be used by an exam import from LMS course/quiz and defines default settings and indicators that are automatically be applied on the exam import. Furthermore exam templates gives you the possibility to map exam configuration template to automatically create and map an exam configuration for an exam on import. This is very convenient if you have a lot of exams to setup that all has the same or similar settings. In such a case you can create an exam template that with all the common settings for that exams and use it on exam import.

Exam templates can be created and managed just like other SEB Server documents within its list/library. The list can be filtered by name and type of the exam template and also shows which one is the default for the institution.

Note: The "Default Template" flag indicates the one exam template that is the default template for an institution. This just means that this template is preselected on the exam import if it exists.

Create new Exam Template

To create a new exam template please use the "Add Exam Template" action on the right action pane in the "Exam Template" list view. SEB Server will then present you the exam template creation view on that some initial settings can be made.

- **Name** The name of the exam template to identify it in the list/library

- **Description** A short description ideally describing the purpose of the exam template

- **Institutional Default** This flag indicated if the exam template shall become the default exam template for the institution.

- **Exam Type** Here you can set the exam type that shall be used when a exam is imported within this template

- **Configuration Template** Select a existing exam configuration template. This template will be used to automatically create and map an exam configuration for an exam that is imported with this template

- **Exam Supporter** Add a list of available exam supporter to the template. These exam supporter will then be assigned to an exam that is imported with this template

After having done all the initial settings, the exam template can be created by saving the settings. SEB server will then present you the exam template administration view that looks similar to the exam administration view.

Here you can edit the settings done before by using the "Edit Exam Template" action form the right action pane. You can also delete an exam template entirely by using the "Delete Exam Template" action from the right action pane. And you are able to add/edit/remove monitoring indicators for the exam template just like you would do for exams in the exam administration view.

Import Exam with Template

Once one or more exam template exists, you are able to select one while importing an exam from the LMS in the "LMS Exam Lookup" section. Just as usual use the "Import as Exam" action for a LMS exam that you want to import.

Now there is a new selector field named "Exam Template" where you can choose the exam template to use on import. When you select one the template attributes like "Exam Type" or "Exam Supporter" are automatically applied from the template settings. You are still able to edit the settings e.g. add more or remove supporter.

If all settings are correct, use the "Save Exam" action from the right action pane to finish up the import. On this step, if the template defines some indicators, this indicators are automatically be created and applied for the exam. The same applies to an exam configuration template that is defined by the exam template, a new Exam Configuration is automatically created by the system from that configuration template and the new exam configuration is applied to the exam.

Note: When an Exam Configuration is automatically be created during an exam import with template, the name for that new Exam Configuration is dynamically generated with the current date and the name of the exam. Also an appropriate description for the Exam Configuration is generated. It is surely possible to just change the name or description of the generated Exam Configuration afterwards.

After successful exam import you see the exam administration view just as usual but with auto generated configuration and indicators from the template. After import you can modify the exam setup as usual by changing, removing or adding settings or indicators to the exam. This will not have any effect to the selected exam template that is only used and applied within the import process at the moment. But the exam template that has been used on import is always been shown on the exam overview as a reference.

Note: A Change in a template is not reflected within already existing exams that used that template on import. But will effect all future exams that this template on import.

Use Cases

Create an Exam Template for Exams of type XY

As an Exam Administrator you want to create an exam template that can be used as template for all exams of type XY that are conducted with SEB and SEB Server within your institution. Since all exams of type XY has the same setup

and almost the same settings, the SEB Exam Configuration differ only in some settings, this would be a of great help while shorten the setup process and reduces the work that must be done to setup such an exam of type XY later on.

- Preparation: Create a Configuration Template that can later be used with the Exam Template.

- Sign in as an Exam Administrator and select the "Exam Template" sub-menu of the "Exam Administration" section in the left menu pane.

- Here you can see the already existing Exam Template within the usual list.

- Use the "Add Exam Template" action to create a new exam template. SEB Server will then present you template initialization form just like the one for importing an exam.

- Here you can give a common name and useful description to identify the new exam template afterwards.

- Also select a type tag and add exam supporter to the template that will be applied to an exam that is imported with this exam later on.

- Now select the previously prepared "Configuration Template" that shall be used by this template. On import of an exam with this template, SEB Server will automatically create a Exam Configuration out of this template and assign it to the imported exam.

- After all initial settings are made correctly you can save the exam template with the "Save" action on the right action pane.

- Add additional indicators to the exam template just like you do in a usual exam administration. These indicators will be copied and applied to an exam that is imported with this template.

- You can change the initial settings any-time by edit the exam template. Use the "Edit" action form the right action pain to do so.

Use an existing Exam Template on Exam import

- Sign in as an Exam Administrator and select the "LMS Exam Lookup" sub-menu of the "Exam Administration" section in the left menu pane.

- Here you can see all exams form the LMS that are bound to the SEB Server. Select the specific exam that you want to import.

- Use "Import as Exam" from the right action pain to import that exam from the LMS as usual.

- In the exam import initialization step you new have a new selector to select an Exam Template that shall be applied.

- If there is a default Exam Template defined for the institution, this is pre-selected and already applied. If not you have to select the template of your choice.

- By selecting an Exam Template the template attributes are already applied and you see the respective attributes in the exam settings.

- Now you can still change the settings the shall differ to the one from the template.

- While saving the exam, the import will be finished up. SEB Server creates a new exam configuration from the defined configuration template and map it to the exam as well as applying the indicators and the rest of the settings defined within the template.

9.1.7 Exam Monitoring

A key feature of the SEB Server is the ability to overview and monitor SEB clients that are connected to the SEB Server and participate in a running exam. It is also possible to interact with individual SEB clients that are connected and send them instructions, e.g.: to quit and reload for example. But the main focus lies on monitoring and the SEB Server don't take automated actions but always only shows incidents as they are defined by indicators to a exam supporter. A exam supporter then can take action.

As an exam supporter you see all running exams where you have been assigned to by an exam administrator in a list.

To navigate to this list click on the "Running Exams" menu within the "Monitoring" category. And you will see the list with the name of the exam, the type and start- and end-time of the exam. If the exam you looking for is not on the list, please check the start-time filter and make sure that it is set before the start-time of the exam. If not, use the filter to set the date before the exams start-date and use the lens-symbol on the right to apply the new filter. If the exam you are looking for is still not on the list, please contact a exam administrator of your institution to get help and check if you are correctly assigned to the exam as an exam supporter.

To monitor an exam either double-click on the list entry of the exam or select the list entry and use the "Monitoring" action form the right action pane to navigate into the main page of exam monitoring.

On the the main page of exam monitoring you find a heat-map list of all SEB client connections that are connected to the exam since the exam is running. There are state filter switches on the right action pane that allows to show/hide SEB client connection of specified states. As default you should see at least all active connections instantly.

The list is automatically sorted in the way that SEB connections with incidents came to the top of the list and are then sorted by the "User Name or Session" identifier criteria. The general SEB client connection attributes are:

- **User Name or Session** The user account or user session identifier sent by the LMS to the SEB client and from SEB client to the SEB Server. This identifier may vary depending on the LMS that is involved. For Open edX it is the user account identifier (username).

- **Connection Info** The IP address of the device the connected SEB client is running plus some additional information about the operating system and the SEB version.

- **Status** The status of the SEB client connection.

The following SEB connection states are defined:

- **Connection Requested** This state appears from when a SEB client contacted to SEB Server the first time until the SEB client has finished up the hand-shake protocol with the SEB Server and the student has logged into the LMS.

- **Active** This state appears after successful hand-shake and login into LMS and stays as long as the SEB connection is available and not closed or terminated

- **Missing** This state appears when a SEB connection is currently in active state but has missing ping (last ping last longer then the highest ping threshold of the ping indicator).

- **Closed** This state marks a closed SEB connection that was once active.

- **Canceled** This state marks a SEB connection that has been canceled.

This general connection attributes are followed by the indicator attributes of all indicator defined by the exam. The column name of an indicator is the name of the indicator defined in the exam. The cell shows the measured value of the indicator for each SEB client connection and the cell is tinted in the color of the reached threshold also defined for each indicator on the exam administration.

Search

Since the monitoring heat-map list is automatically sorted and cannot be filtered except on connection status, there is a search feature to find a particular connection or a set of connections. To search connection on a running exam, please use the "Search" action from the right action pane. A search pop-pup will appear with all connection is a usual list with the possibility to filter and sort the entires. Double-click on an entry to go to the detail view of the specified SEB client connection.
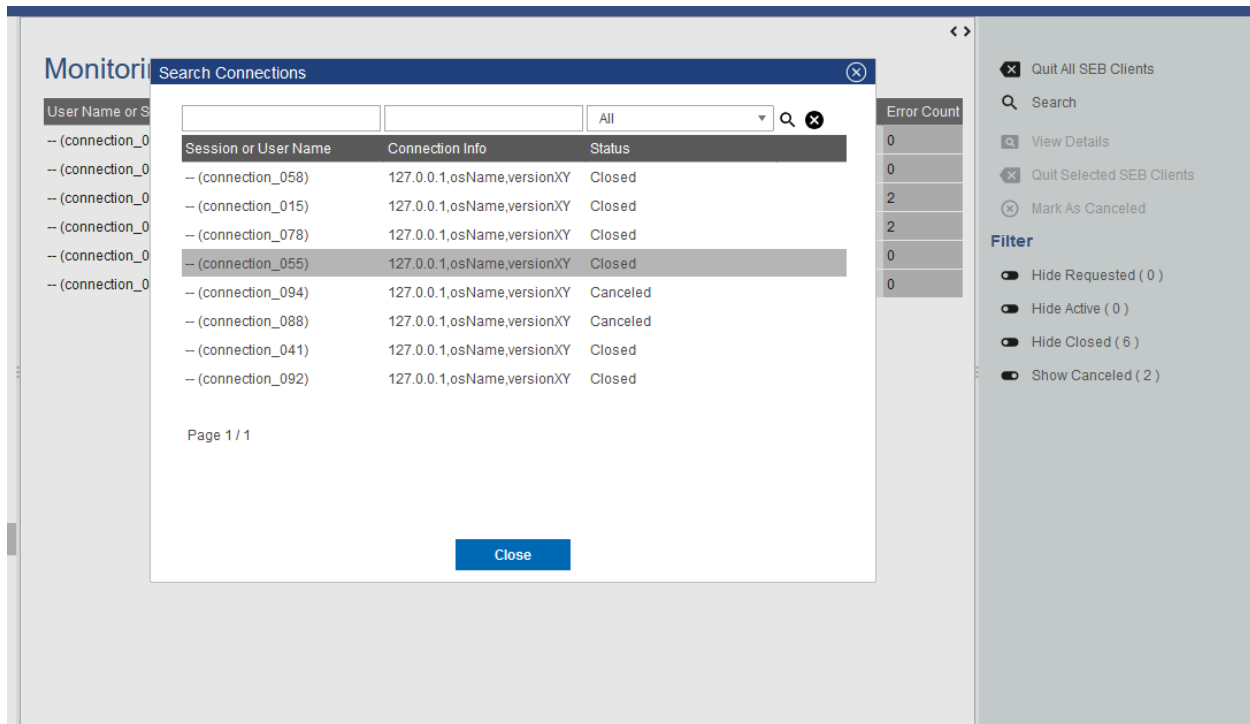
Instructions

Instructions are actions applied to one or more SEB client connections that also can apply a signal to a active SEB Client connection to instruct the SEB client to do a particular action on client side. In the monitoring view you can select one ore more list entries with usual list (multi)selection by holding Ctrl or Shift key plus right mouse click(s). Currently there are two instructions.

- **Quit SEB Client** Sends a quit instruction to the SEB Client to quit the session. This can be applied to all active SEB client connection with the "Quit all SEB Clients" action from the right action pane or to all selected SEB client connections with the "Quit Selected SEB Clients" action.

- **Mark As Canceled** Can be applied to all inactive SEB client connections to enforce the inactive SEB client connection to "Canceled" state. This can be used to mark and remove inactive SEB client connection you don't want to have on the main monitoring board anymore when the filter for canceled SEB client connections is set to hide.

Filter

There are connection state filter to hide/show SEB client connection in particular states. These are located in the right action pane hand has the name of the filter action that will be performed on click (hide/show) and the name of the affected connection status. With this actions you are able to toggle between hide and show SEB client connection of a particular state.

- **Show/Hide Requested** Use this to show or hide all SEB client connections that are currently in the "Requested" state and are not responding anymore.

- **Show/Hide Active** Use this to hide SEB client connections in active state that has no incident and are not missing. If this filter is enabled and an active SEB connection gets an incident or is marked as missing it suddenly appears in the list. So no incidences are accidentally hidden. This feature is best used for exams with a lot of participants to keep a good overview.

- **Show/Hide Closed** Use this to show or hide all SEB client connections that are currently in the "Closed" state.

- **Show/Hide Canceled** Use this to show or hide all SEB client connections that are currently in the "Canceled" state.

Since SEB Server version 1.3 each filter also shows the current number of connection in the particular state. Now one has an overview of how many connections are there for an exam and in witch state.

Note: When a certain state filter is set to hide and a particular SEB client connection switches into that state, it will automatically disappear from the list.

Detailed View

To view more details of a particular SEB client connection either select the SEB client connection entry from the list and use the "View Details" action from the right action pane or just double-click the SEB client connection entry from the list. In the details view you also see all the attributes in a form and additional a list of all events and logs the SEB client has sent to the SEB Server for this session so far.

The table shows the event type that for all log-events is the log-level, The text and a value that has been sent with the event. The Value may be empty and marked as "Not a Number" (NaN). In this table we also have the client- and the server-time of the event. The client-time is the time the SEB client sends along with the event to the SEB Server and the server time is the time the SEB Server got the event. With this it is also possible to see or overview temporary network latency or other irregularities, when this two time values differs much.

In the detail view you are also able to use the instructions "Quit SEB Client" and "Mark as Canceled" for the selected SEB client connection.

Live Proctoring

Note: This feature is still in a prototype state and not all functionality might work as expected. Basically the meeting features are given or restricted by the meeting service that is used and the API and GUI that is given by that meeting service client

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Proctoring (Collecting) Rooms

When the exam live proctoring feature is enabled for the running exam (see *Live Proctoring*), SEB Server will automatically create and collect connected SEB clients into so called collecting rooms. The size of this collecting rooms can be defined within the proctoring settings in the exam. One proctor can then open such a collecting room by left-clicking on the room action. SEB Server will then open a proctoring window and join the proctor to the meeting where the participants of this room can be seen.

A proctor is also able to view the names of all participants of a room by right-clicking on the specified room action. SEB server will then open a dialog with a list of all participants. Double-clicking on a particular participant will automatically load the detailed monitoring view of that participant.

Note: A collecting room, once created will live as long as the exam is running and not has been deleted. When the exam ends or is been deleted, the collecting room will automatically get deleted on the SEB Server's persistent storage as well as on the meeting service side if needed.

Town-Hall Feature

Beside the usual collecting room, there is a town-hall room feature. By using the "Open Townhall" action from the right action pane, SEB Server enforce all SEB clients that are in collecting rooms as well as new connecting SEB clients to leave their current meeting and join the town-hall meeting for as long as the town-hall is active. Within the town-hall a proctor has the same features as in the collecting room but can connect to all participants at the same time. When the town-hall is closed all connected SEB clients are enforced to leave the town-room and go back to its collecting room meetings again.

Note: This feature is only available if it is enabled within the exam proctoring settings in the exam administration.

Single Room or One-to-One Room Feature

Another live proctoring feature can be found in the detailed monitoring view of one particular SEB client connection.

The single room features allows a proctor to connect to a single participant and being able to view or communication with just this one participant. You can initiate this single room connection by using the "Single Room Proctoring" action on the right action pane. SEB Server will then enforce the involved SEB client to leave its collecting room and join a newly created room with the proctor. Within the single room a proctor has the same features as in the collecting room to communicate with the student or participant. When the single room is closed the connected SEB clients is enforced to leave the single room and go back to its collecting room meetings again.
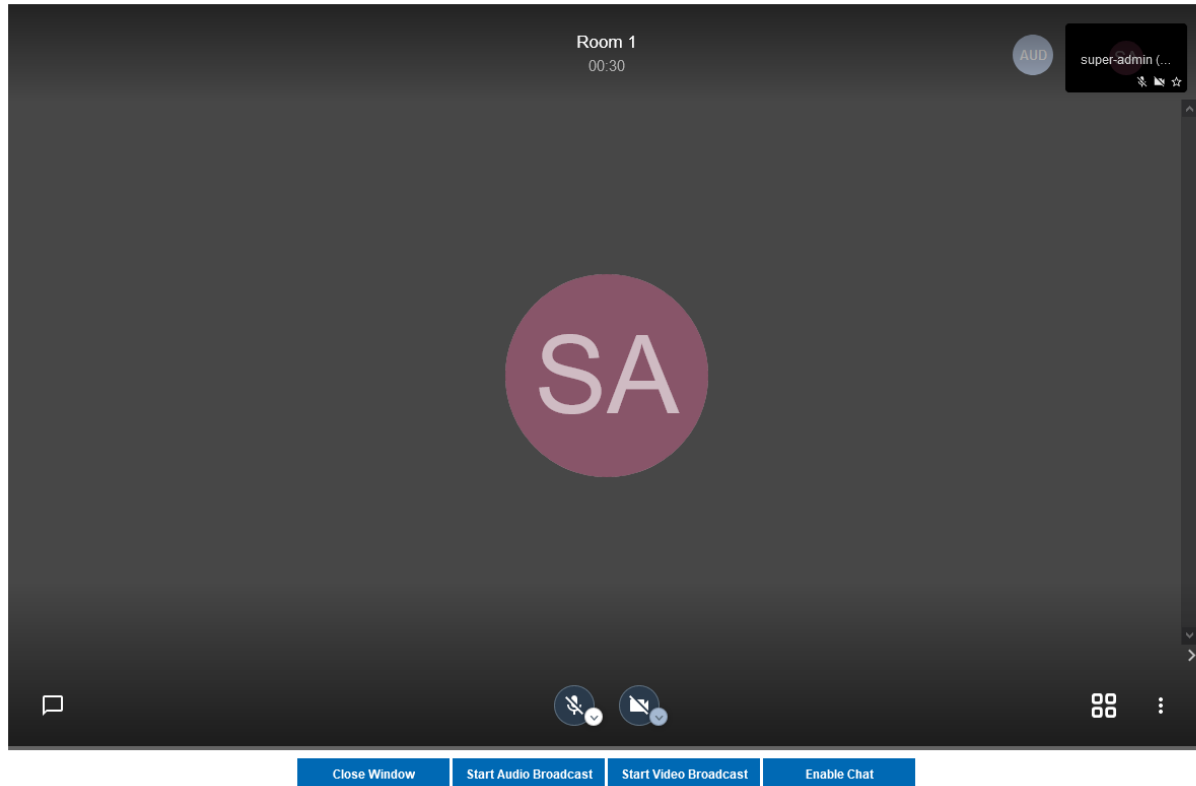

Note: This feature is only available if it is enabled within the exam proctoring settings in the exam administration.

Boradcast Features

Within a live proctoring window a proctor can use the enabled features of the integrated meeting service. And is able to communicate with the SEB clients by using one of the following features if available for the service:

- **Start Audio Broadcast** Will enforce the SEB clients within the particular room to enable receive audio and a proctor can speak to the students that are in the meeting.

- **Start Video Broadcast** Will enforce the SEB clients within the particular room to enable receive audio and video and proctor is shown to the students that are in the meeting and can speak to them as well.

- **Enable Chat** Will enforce the SEB clients within the particular room to enable the chat feature and a proctor is able to chat with all students in the meeting.

While a broadcast feature is enabled by a proctor, the SEB Server sends an instruction to each SEB client that is within the same meeting to display the meeting client. A Student as well as a proctor is then able to use all the features of the meeting client of the integrated meeting service.

Note: Each of this features is only available if it is enabled within the exam proctoring settings in the exam administration.

Known Issues with Live Proctoring

- Within the Zoom service it often happens that a participant appear twice in a room or meeting. This is probably caused by SEB clients rejoining the meetings while rooms or feature settings are changed.

- In Zoom it is not possible to fully control a participant microphone. Therefore it may happen that participant can hear each other even if no proctor is in the meeting.

- Within Jitsi Meet service when a proctor leaves the room it currently happens that a random participant became host/moderator since it is not possible in Jitsi Meet to have a meeting without host. We try to mitigate the problem with the moderator plugin or Jitsi Meet SaS

- In both services while broadcasting, it is not guaranteed that a student always see the proctor. Usually the meeting service shows or pins the participant that is currently speaking automatically.

All SEB Client Logs

As an exam administrator as well as an exam supporter, you are able to search SEB client events for all exams that have been run on the SEB Server and that you have access to within your user-account privilege settings. As an exam supporter you will only see the SEB client logs of the exams you are assigned to. To search all SEB client log events, go the the "Monitoring" section and click on the "SEB Client Logs" menu on the left menu pane. The SEB Server will show you a list of all SEB client logs ever happen and you have access to. You can filter and sort the list as usual by using the filter above to find all logs of an exam for example.

To show a detailed view of a specific SEB client log, just double click on the list entry or select the specific list entry and use the "Show Details" action form the right action pane to open up a pop-up containing all related information about the SEB client log event.

Currently there is no export functionality to export all interessting SEB client logs to a CSV table for example. But such a feature will probably come with a next version of SEB Server.

Export filtered client logs

To export all currently filtered client logs in CSV format, please use the "Export CSV" action form the right action pane. SEB Server will then convert and download all client logs for you. This might take some time if there are a lot of logs to export.

Note: Please avoid exporting of huge log files while one or more performance intensive exam are running to not stress the service unnecessarily.

Delete filtered client logs

To delete all currently filtered client logs, please use the "Delete Logs" action form the right action pane.

Note: On deletion, all available logs will permanently be deleted from the persistent storage. So please make sure you want to delete all logs that are currently displayed in the list before deleting.

9.1.8 Troubleshooting

This page's purpose is to collect frequently ask questions, problems and workarounds that are reported and known. There shall be at least a problem description, an optional explanation if needed, a solution description and the SEB Server version and domain information. For Example:

Please also have a look at Open Issues and/or Ongoing Discussions on the Git-Hub page.

- **Version** : 1.0.0

- **Domain** : Exam Administration / Exam / Indicator

- **Problem** : This is an example problem description.

- **Explanation** : An explanation is not mandatory but shall be provided if you want to give some background information to the problem.

- **Solution** : A description of the solution, workaround or upcoming fixes.