

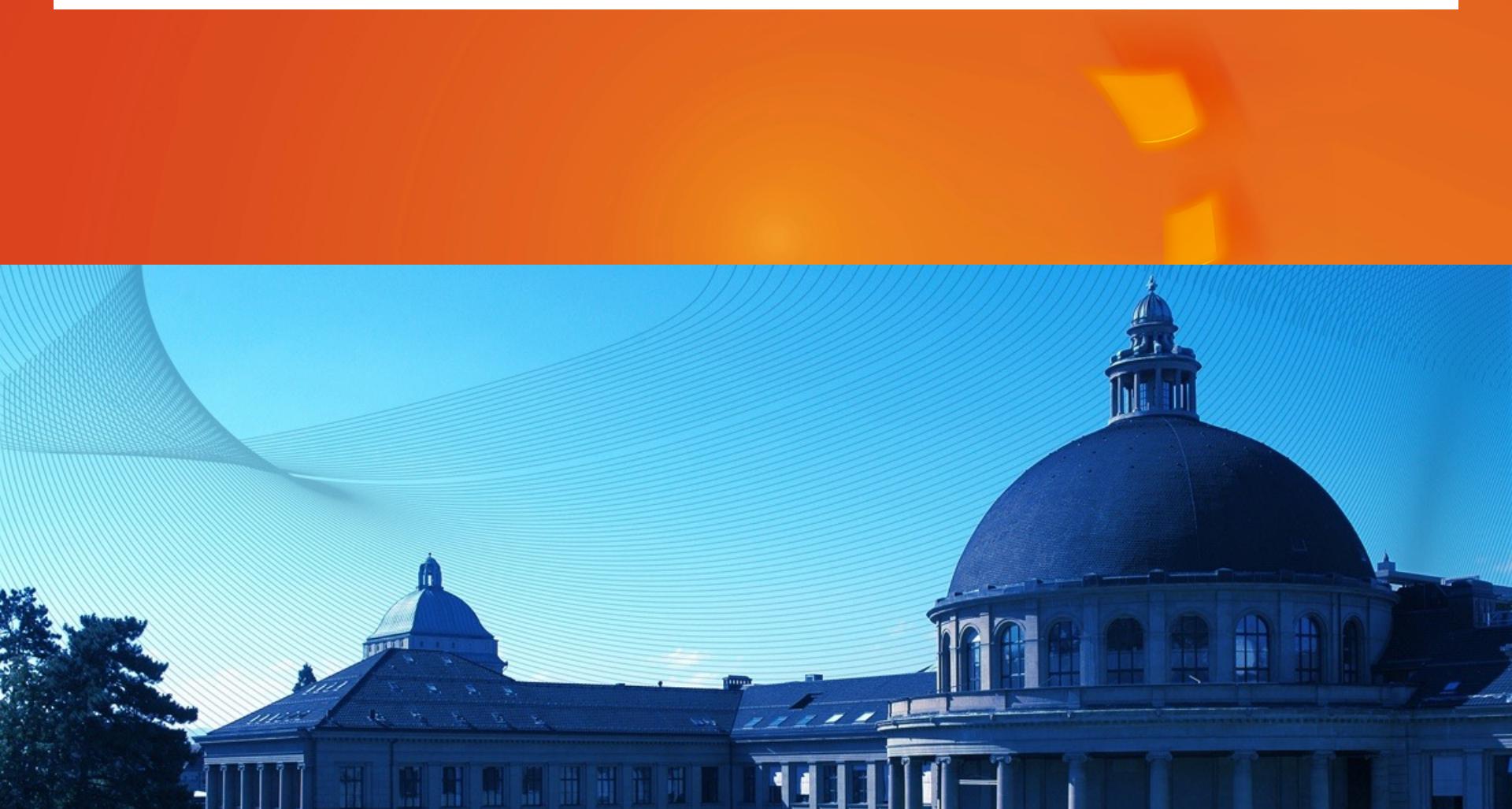
Safe Exam Browser, the Modular Freeware Solution for Secure E-Assessment

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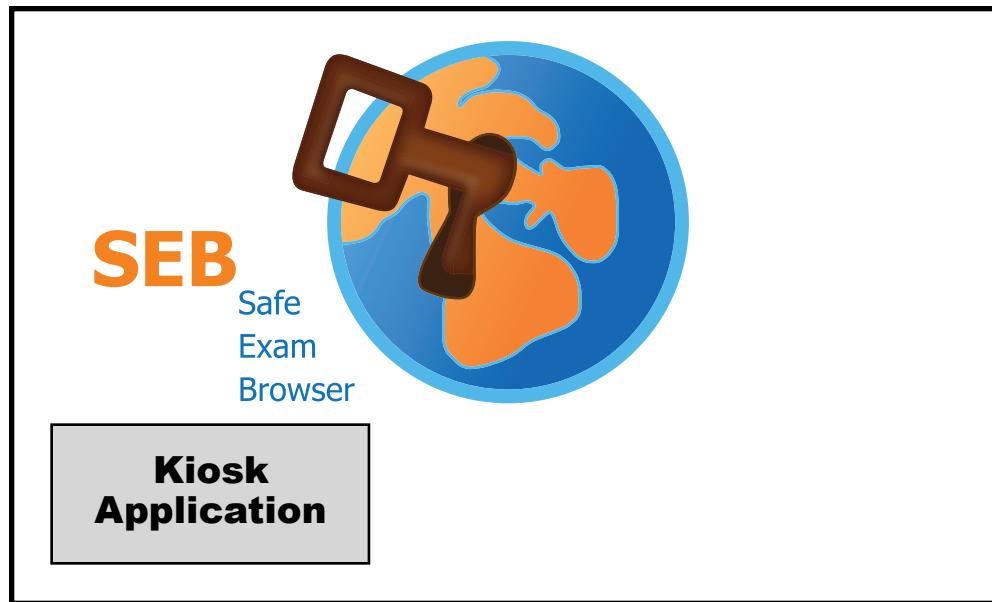
Introduction



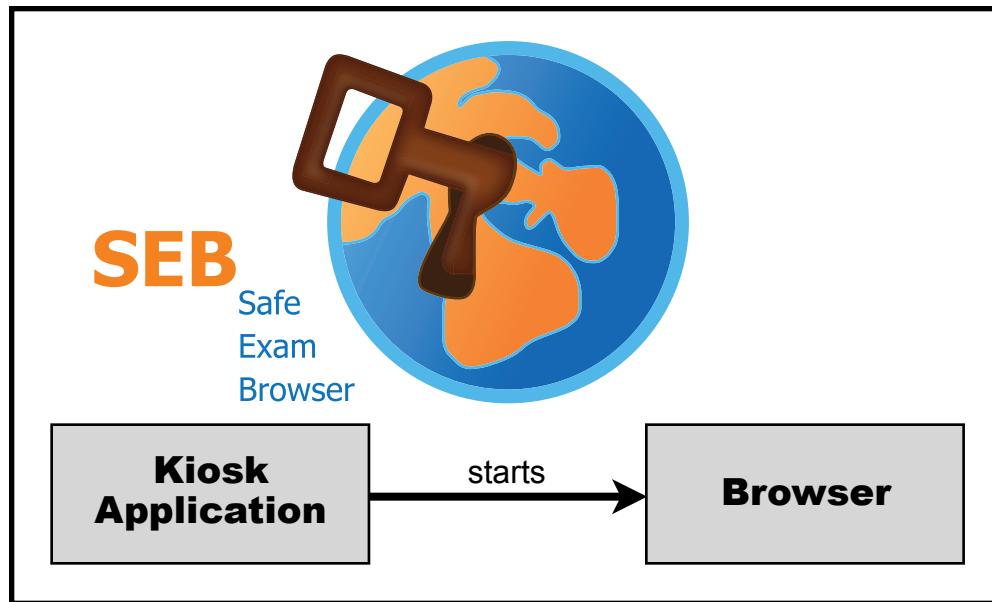
What is Safe Exam Browser (SEB)

- Secured web browser application
- For conducting exams on computers (Windows/Mac OS X) using web-based
 - exam systems
 - quiz modules of learning management systems
- Exams using third party applications

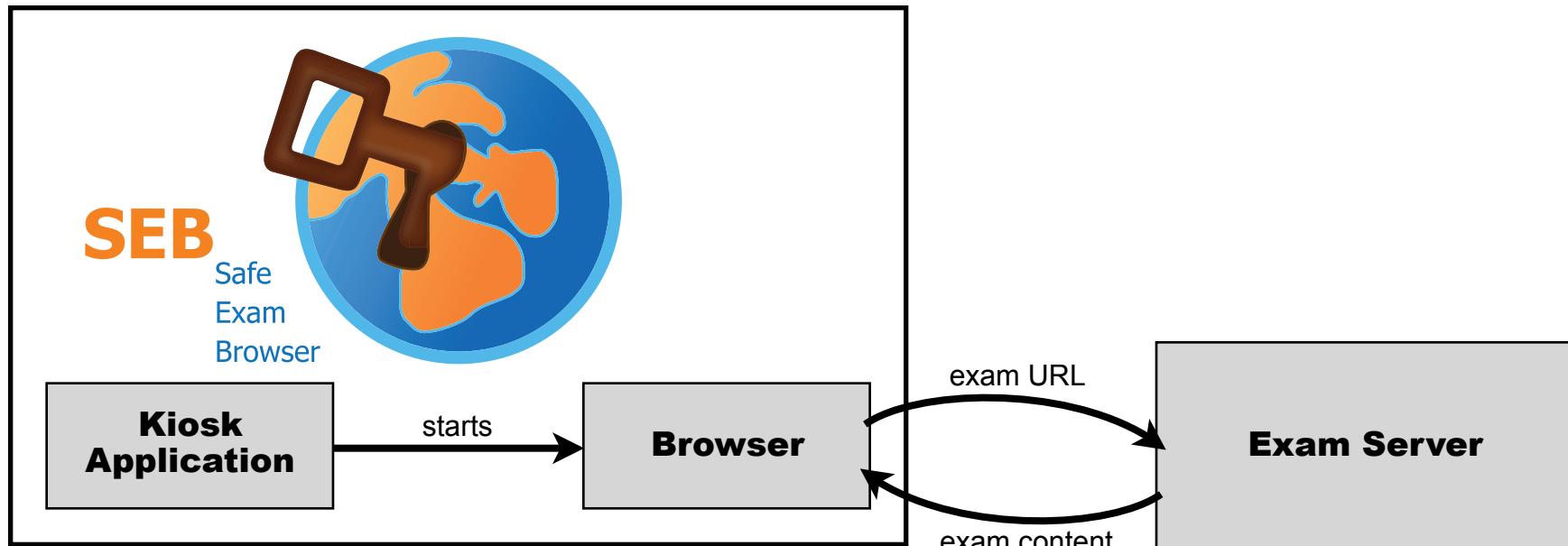
SEB: A Modular Tool for Secure E-Assessments



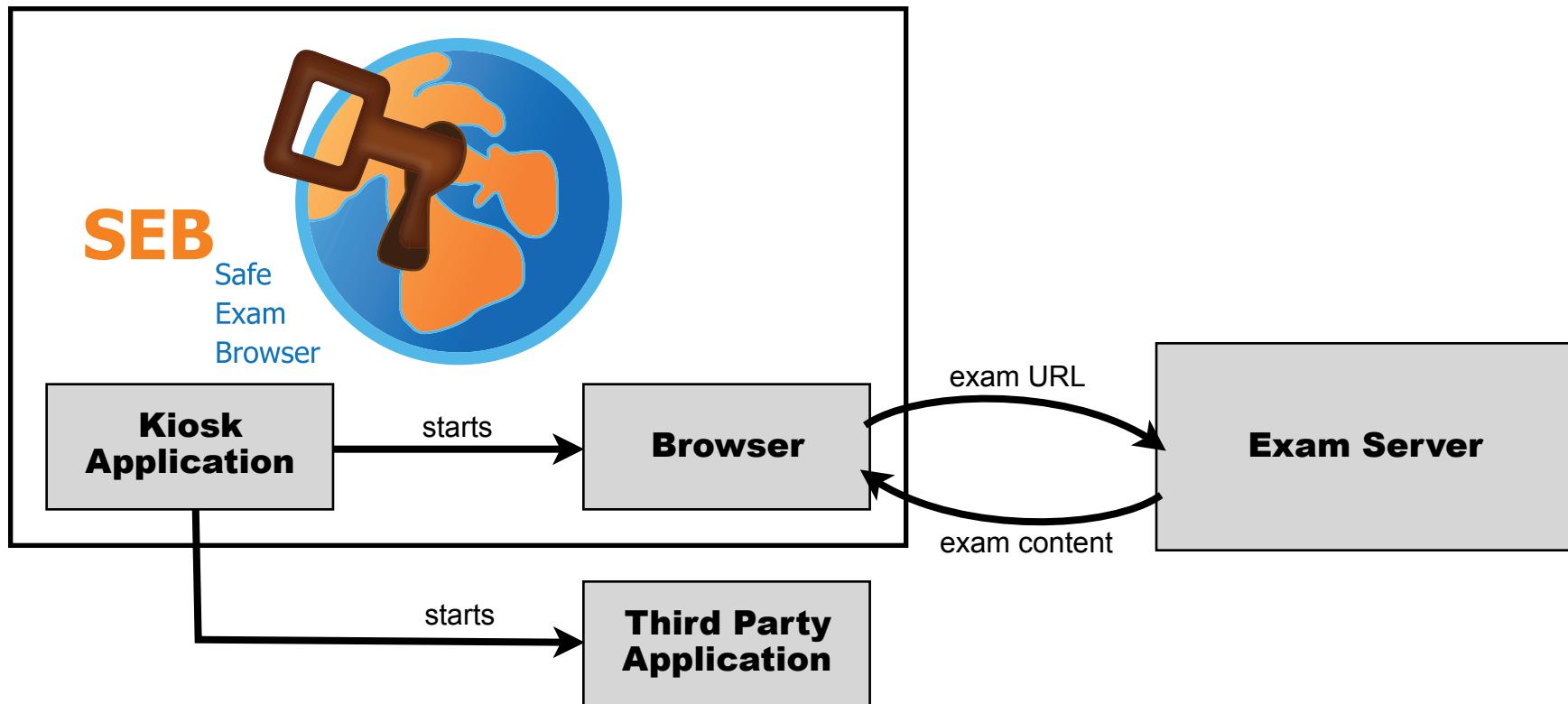
SEB: A Modular Tool for Secure E-Assessments



SEB: A Modular Tool for Secure E-Assessments



SEB: A Modular Tool for Secure E-Assessments



Safe Exam Browser is ...

- **Open:** Compatible with any computer based exam system
- **Flexible:** Computer labs, BYOD, desktop, tablets
- **Modular:** Third party applications, VDI, SEB Server
- **Free:** Open source, freeware, no centralized cloud service

History: Safe Exam Browser Project

- Idea by Stefan Schneider at University of Giessen, our Windows browser developer
- Developed since 2008 mainly at ETH Zurich
- Partly publicly funded (2010-2014) by national Swiss e-learning programs
- Open for community suggestions and contributions
- Global user base
- Integrations with various exam systems, for example Moodle, ILIAS, OpenOLAT, Inspera Assessment

Safe Exam Browser – Future of the Project

The options we examined in the last 7 months:

1. SEB Consortium
2. ~~Spin off company~~
3. Something small and inside ETH

In all cases SEB shall remain open source/freeware

SEB Consortium - Vision

- SEB is under the Mozilla Public License and freely available
- Deliver, enhance and support SEB for organizations wishing to perform e-assessments
- SEB shall be recognized for its quality of software, its security and data privacy as well as its engagement with the user, standards and development communities.
- The SEB Consortium is established to provide a structure whereby the Community can support the direction and development of the SEB project through financial and other contributions

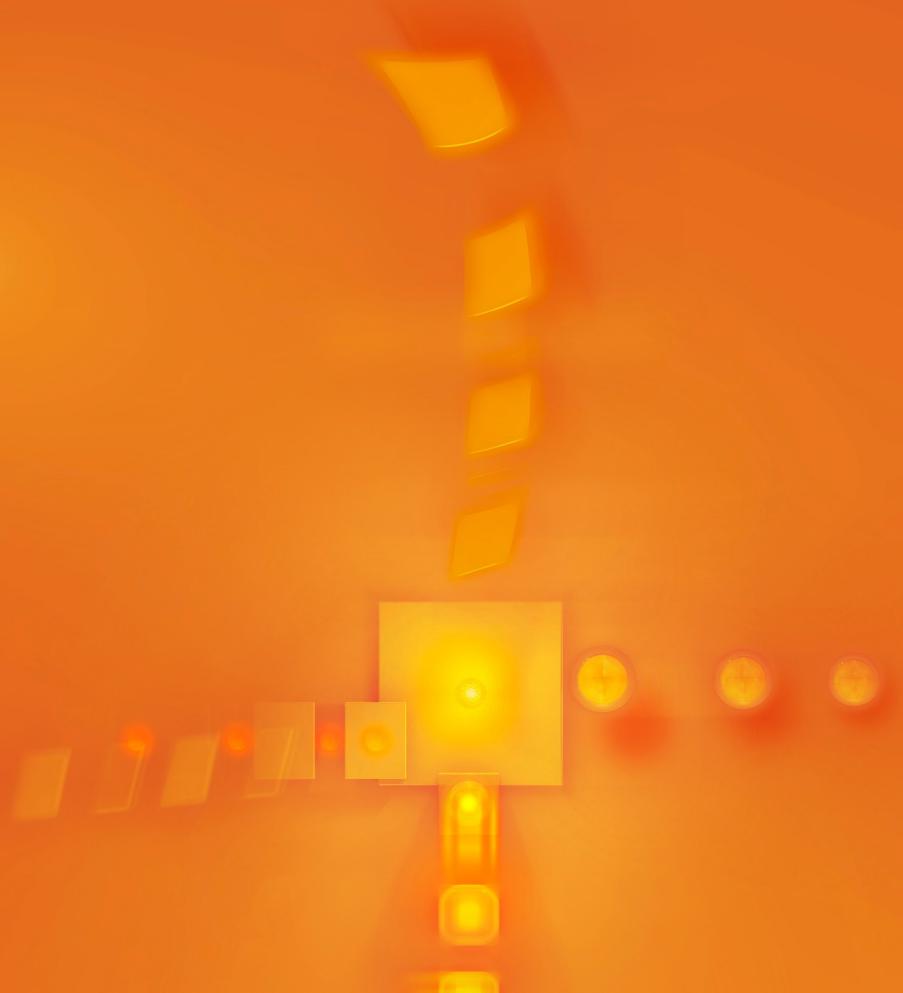
SEB Consortium - Tasks

- Foster the development of a flexible lockdown browser for educational and commercial use
- Provide financial and infrastructural support for at least two SEB-developers to allow ongoing development of SEB within the consortium
- Sustain and develop the existing community of interest for the SEB project
- Support the use and adoption of SEB software

SEB Consortium – Benefits & Membership Fees

Category	Membership Fee	Who should join?	Benefits
Principal Members	€ 50,000 US\$ 60,000	Educational Institutions, Companies	Prioritize SEB development goals, get direct, personal development support and consultancy by the SEB developers. Logo of institution/company is placed on consortium website
Gold Members	€ 10,000 US\$ 12,000	Educational Institutions, Companies	Suggest SEB development goals, build a feature list for SEB, Get direct, personal development support and consultancy by the SEB developers. Logo of institution/company is placed on consortium website
Silver Members	€ 5,000 US\$ 6,000	Educational Institutions, Small Companies, public authorities	Suggest SEB development goals, logo of institution/company is placed on consortium website
Bronze Members	€ 2,500 US\$ 3,000	Small Educational Institutions, Small Companies	Logo of institution or company is placed on consortium website

What's New in Safe Exam Browser



What's New: SEB 2.1 for Windows and Mac OS X

- Touch optimized mode for Windows tablet computers
- Buttons for restart exam, reload page, change keyboard layout, current time can be displayed
- Process monitoring
- Individual proxy settings, URL filters and server certificates can be used per exam
- New settings for page and text zoom, disable spell check, browser user agent
- Re-engineered SEB Config Tool now allows comfortable editing and testing of SEB configuration files

Live Demo

Using Virtual Desktop Infrastructure with SEB



Online Exams at ETH Zurich

Swiss Federal Institute of Technology

- 2007 first pilots, 2010 regular service
- >50 exams with ~5'000 students in spring semester 2015
- Large percentage of selective, high-stakes examinations
- Summative exams designed by lecturers
- Important role of first year university exams in Switzerland



Competency oriented exams using third party applications



Exam tasks today



learning



exam



application
/ competence

Example: Programming

① This file uses Cell Mode. For information, see the [rapid code iteration](#)

```
13 - M = 10^5; % Number of Monte Carlo samples
14 -
15 - g1 = @(x) (x+0.25).^3; % integrand 1
16 - exact_g1 = (1.25^4-0.75^4)/4; % exact value
17 -
18 * Applying MC and antithetic MC
19 - [Smean1, Svar1] = MC(g1,2*M);
20 - [antiSmean1, antiSvar1] = MCantithetic(g1,2*M);
21 -
22 * parameter for 0.95-confidence interval
23 - beta = norminv(0.975, 0, 1);
24 -
25 * Output:
26 - fprintf('\nQuestion 5:\n\n')
27 - fprintf('Exact value = %.5f\n\n', exact_g1(1))
28 - fprintf('standard Monte Carlo with M = %d\n', M)
29 - fprintf('Sample mean is: %.5f\n', Smean1)
30 - fprintf('Asympt. valid 0.95-confidence interval: %.5f\n', ...
31 -     Smean1 - beta*sqrt(Svar1/2/M), Smean1 + beta*sqrt(Svar1/2/M))
32 - fprintf('length of asympt. valid 0.95-confidence interval: %.5f\n', ...
33 -     2*beta*sqrt(Svar1/2/M))
34 - fprintf('antithetic Monte Carlo with M = %d\n', M)
35 - fprintf('Sample mean is: %.5f\n', antiSmean1)
36 - fprintf('Asympt. valid 0.95-confidence interval: %.5f\n', ...
37 -     antiSmean1 - beta*sqrt(antiSvar1/M), antiSmean1 + beta*sqrt(antiSvar1/M))
38 - fprintf('length of asympt. valid 0.95-confidence interval: %.5f\n', ...
39 -     2*beta*sqrt(antiSvar1/M))
40 -
41 end

42
43 function [Smean, Svar] = MC(g,M)
44 % This function computes a Monte Carlo approximation
45 % \int_{-1}^{1} g(x) dx with M samples.
46 % Input: g = function handle for the integrand
47 %        M = number of Monte Carlo samples
48 % Output: Smean = sample mean
49 %          Svar = sample variance
```

learning

```

function zahlenia
% Dies ist ein Z
% Ziel ist es ein
% in möglichst w
zahl = randi(10)
test = -1;
while (test ~= za
test = input('Ra
versuche = versuche -
if (test <= zahl)
    disp ('Zu
elseif (test > za
    disp ('Zu g
end

```

exam

target competence

The goal: authentic, competence oriented exam tasks



learning

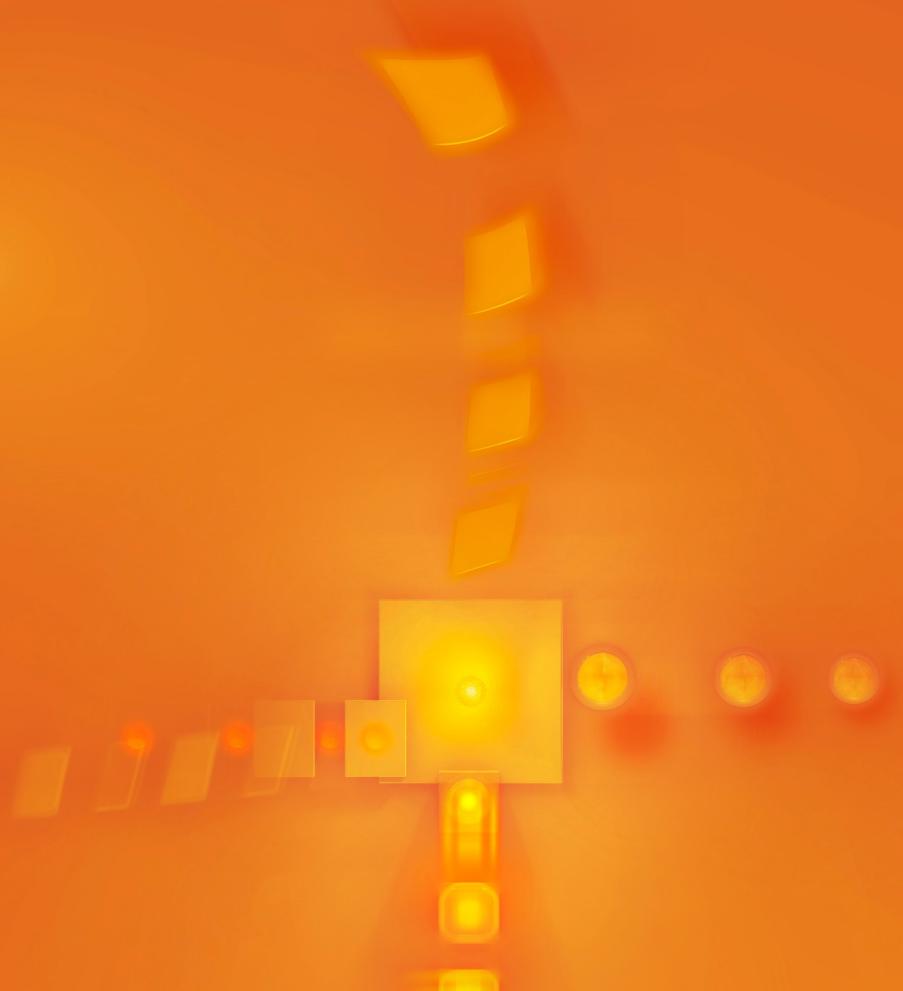


exam



application
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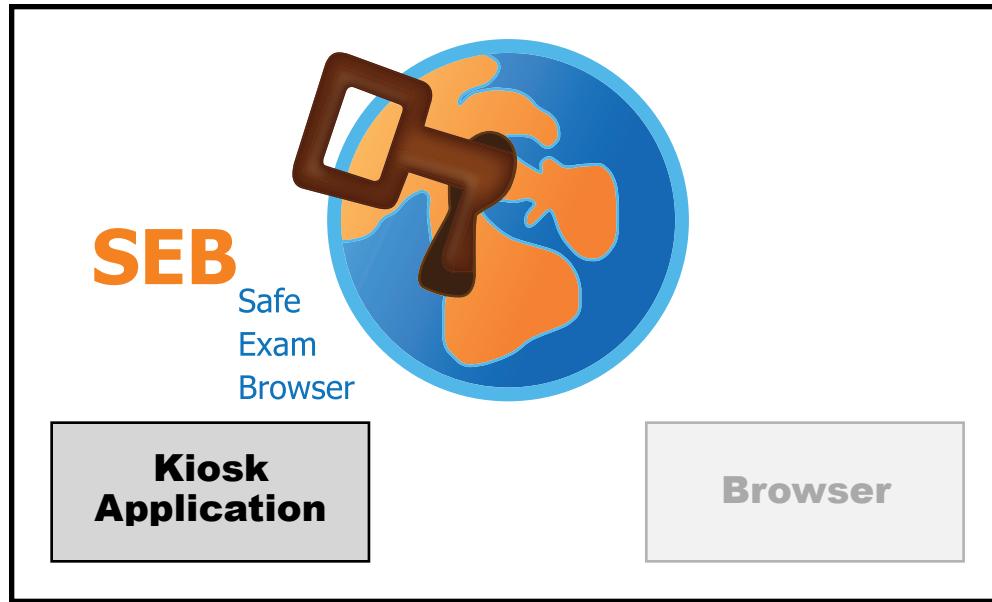
How does it work?



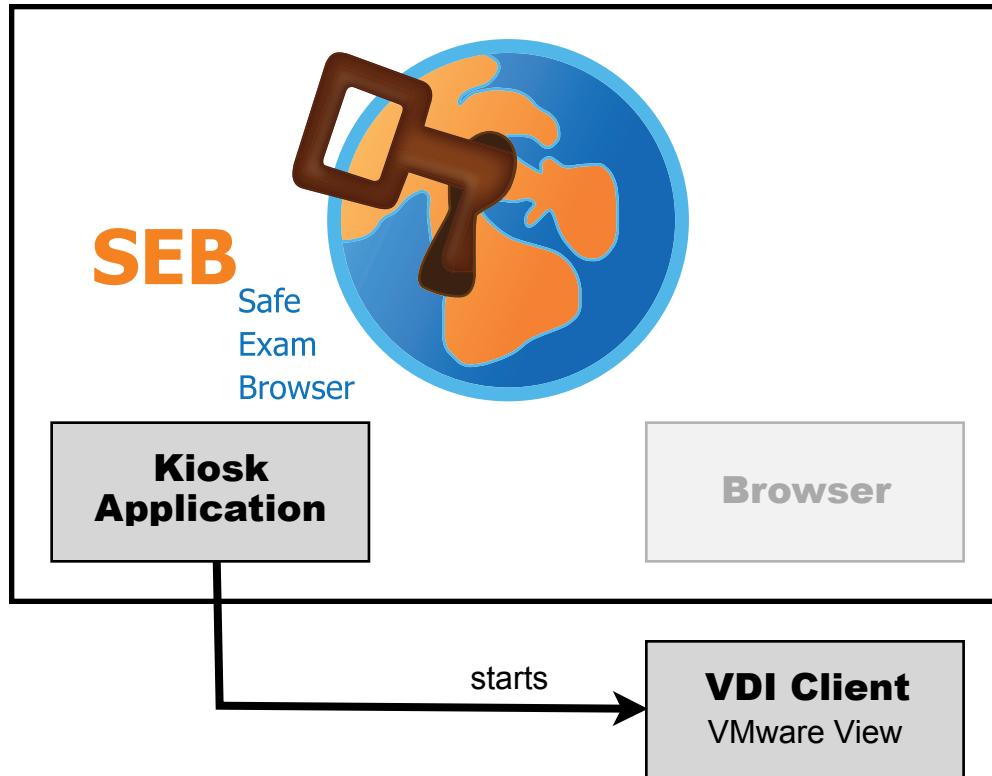
Technology: Requirements

- Secure, fraud-proof
- Reliable, robust
- Easy to use, familiar (for students)
- Easy to customize and manage (for administrators & examiners)

SEB with VDI

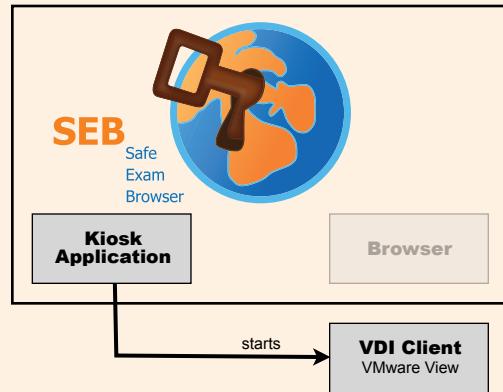


SEB with VDI



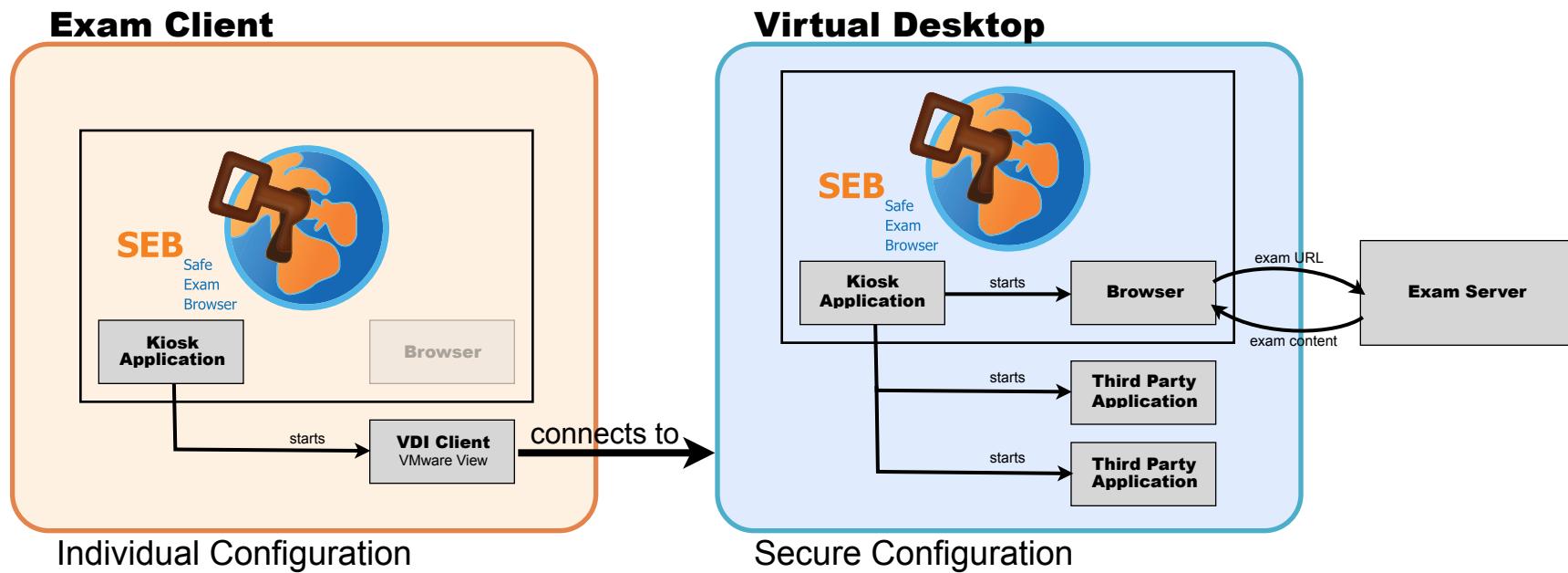
SEB with VDI

Exam Client



Individual Configuration

SEB with VDI



Future Roadmap

- SEB 2.2
- SEB for iPad
- New browser engine in SEB for Windows
- SEB Server

SEB 2.2

- Release for Windows, Mac OS X, iOS
- Opening of permitted resources in additional browser windows, accessible via individual icons and popup menus placed in the SEB task bar (configurable per exam).
- Improved handling of downloads, allows restricting access to particular file types, which may then be opened with associated permitted third party applications.
- Improved URL filter also in SEB for Windows
- New settings for presetting language dictionaries (spell check)

SEB for iPad

- Works on managed iOS devices and with BYOD
- Opening of permitted resources (HTML, PDF etc.) in additional browser tabs
- With embedded permitted resources pure offline exams are possible
- Built-in support for hand drawings
- Supporting most setting options of the SEB desktop versions

SEB Server

- Central management of SEB clients for exams:
Configuration of client settings for different exams in a web backend.
- Clients receive exam settings automatically from the SEB Server.
- Improved security with automatic three-way authentication between SEB clients, exam system and SEB Server which drastically eases configuration.
- Easy to operate remote supervising/proctoring functionality such as screen recording and logging of user activity without requiring third party software solutions.

SEB Server

Keeping the SEB exam solution modular and compatible with a wide range of exam systems

- Open source and freely available
- API to connect to exam system
- Installation on common open source servers
- Scalable: A centralized SEB Server for a large number of institutions will be possible

Links

- www.let.ethz.ch/pruefungen/onlinepruefungen/index_EN
- www.safeexambrowser.org

**Thank you for your attention.
Please discuss...**

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