

# Programming Exercises in LON-CAPA

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LON-CAPA Conference  
and Workshop 2017

Salzgitter

Suderburg

Wolfenbüttel

Wolfsburg

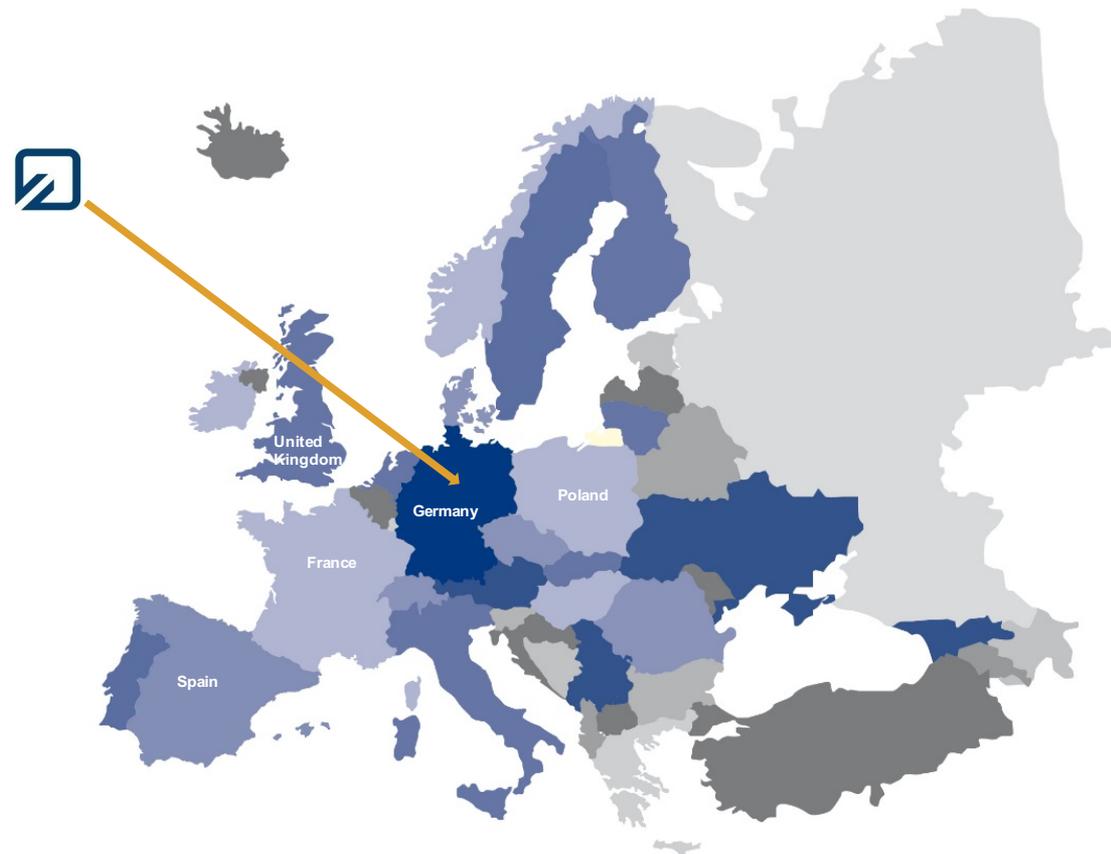
# Overview

- project
- motivation
- presentation
- proposed architecture
- implementation
- challenges
- results from testing
- further project plan



# Ostfalia University of Applied Sciences

- 12 faculties
- ~ 12000 students
- 4 locations



# Ostfalia University of Applied Sciences

## Salzgitter

- Transport-Sports-Tourism-Media



## Suderburg

- Civil and Environmental Engineering
- Trade and Social Work

## Wolfsburg

- Automotive Engineering
- Public Health Services
- Business



## Wolfenbüttel

- Electrical Engineering
- Computer Science/IT
- Mechanical Engineering
- Law
- Social Work
- Supply Engineering



## About ZeLL

ZeLL: Zentrum für erfolgreiches Lehren und Lernen

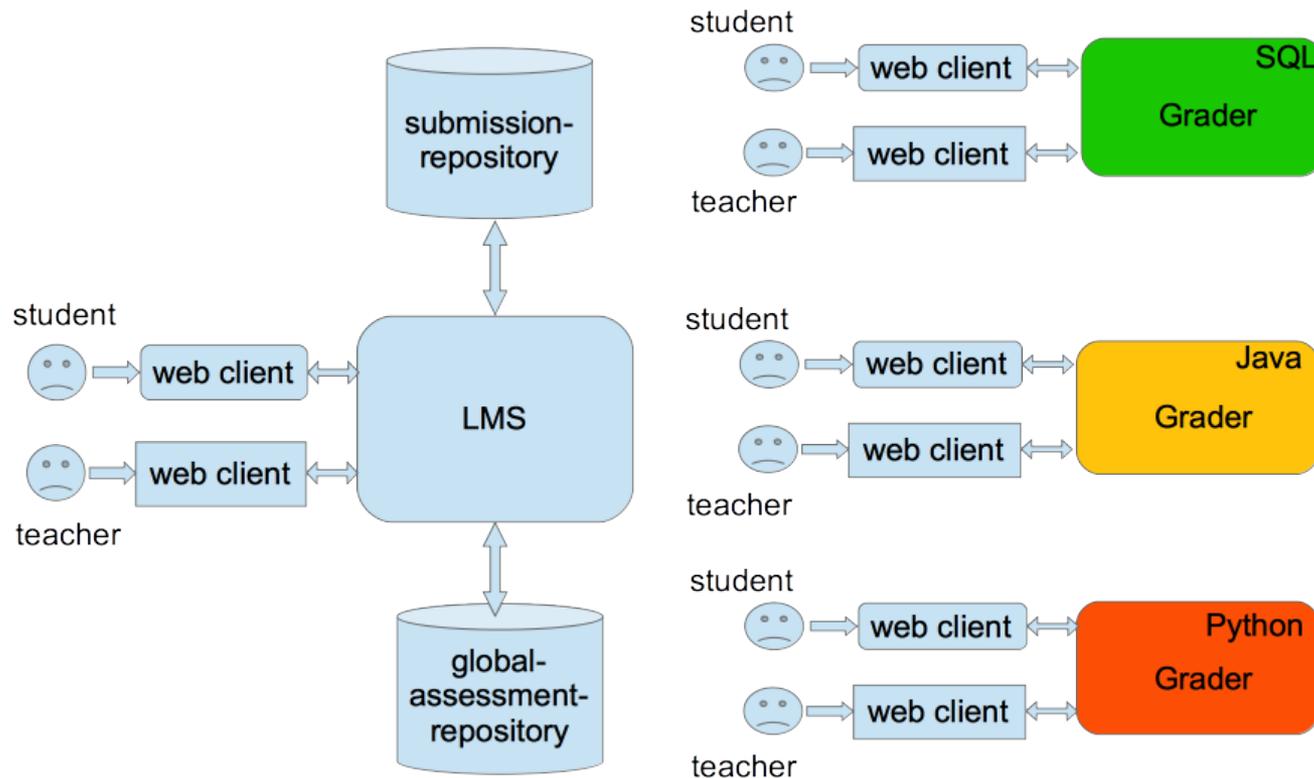
- aim: improve teaching and learning in higher education
- consists of:
  - „Matheplus” – intensive math courses
  - “lerncoaching” – coaching for students
  - educational – coaching for lecturers to use clicker, JiTT, formative Assessment
  - eLearning – eCompetence and utilities for learners and teachers
    - task: improve formative assessment of programming exercises
    - partners: TU Clausthal, Hochschule Hannover, Uni Osnabrück, many more..

# eLearning

- part of project:   
eCompetence and Utilities  
for Learners and Teachers
- various German universities involved
- at Ostfalia University:
  - formative assessment of programming exercises
  - connect course management systems (CMS) and grading engines



# Motivation



# Presentation

Write a program which prints "Hello World!" (without quotation marks). The program should contain a method that returns "Hello World!". The class should be named "HelloWorld" and the method should be named "greet".

Your submissions:

▶ Submission 1

▶ Submission 2

▶ Submission 3

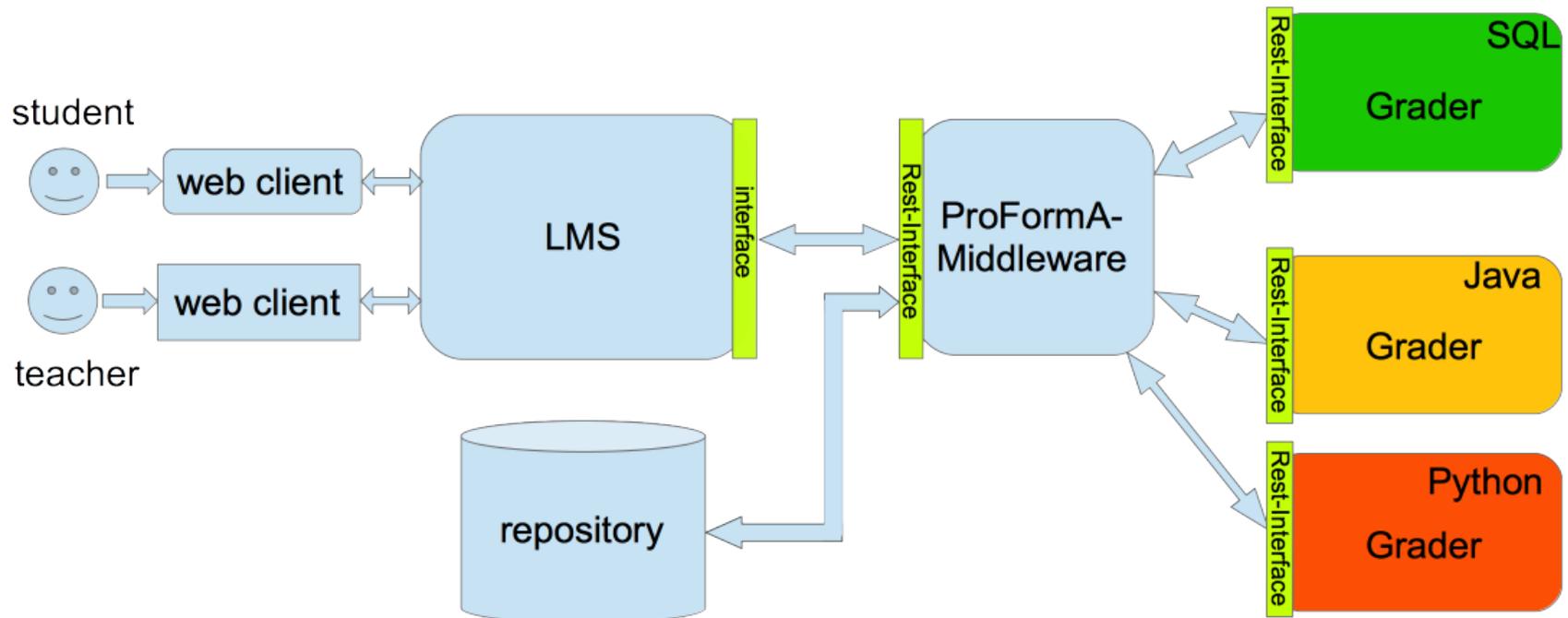
[Hinweise zur Benutzung](#)

Please enter your solution here:

```
1 public class HelloWorld {  
2  
3     public static String greet() {  
4         return "Hallo World!";  
5     }  
6  
7     public static void main(String[] args) {  
8         System.out.println(greets());  
9     }  
10 }
```

->[https://vita.ostfalia.de/priv/fhwf/ecult/Java/Hello\\_World.problem](https://vita.ostfalia.de/priv/fhwf/ecult/Java/Hello_World.problem)

# Proposed architecture





## Proposed architecture

- extend possibilities of LMS with external grading engines
- combine advantages:
  - use management power of LMS
  - use grading power of external grading engine
  - students: single interface for class materials and exercises
- using the „XML exchange format for programming exercises“ (proforma-xml)



# Implementation

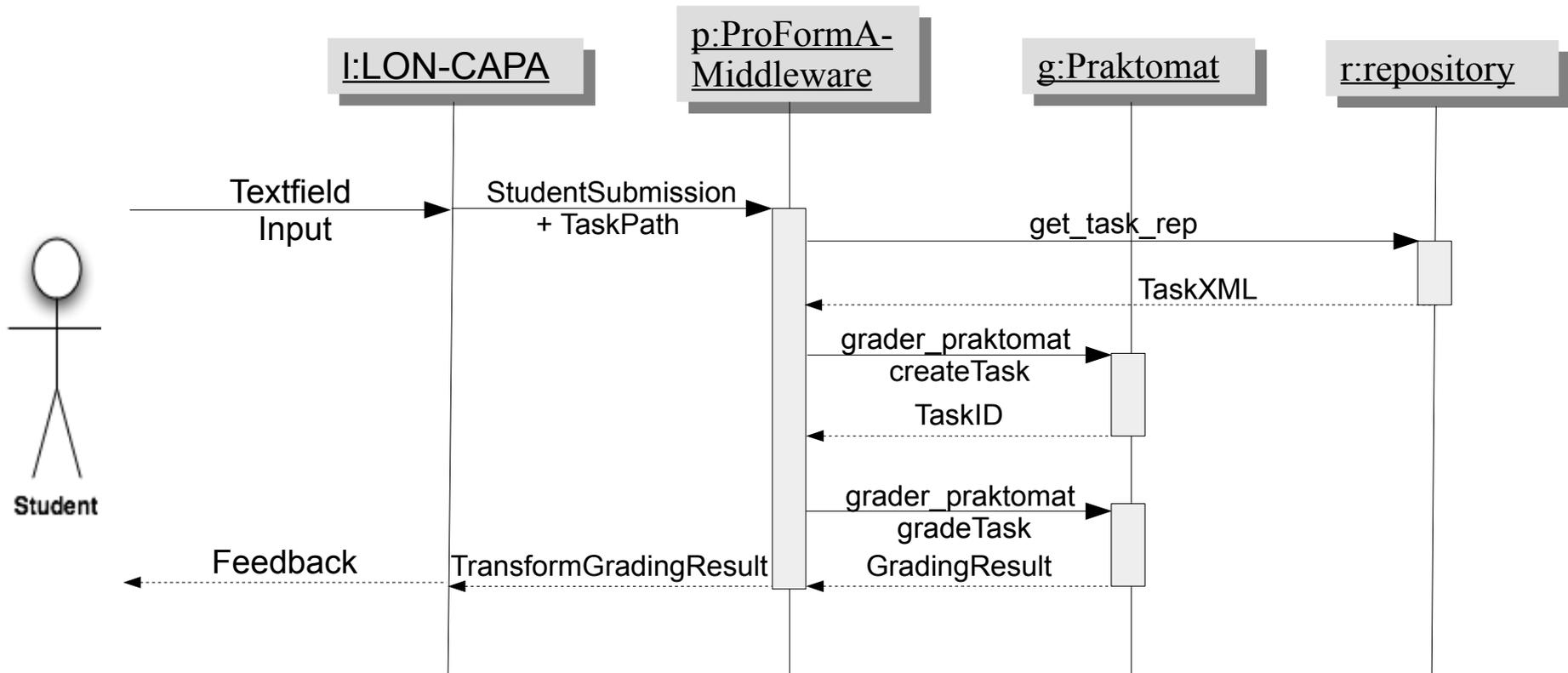
- Using plain LON-CAPA with External Response
  - Adding three of our libraries
    - + simpler
    - + convenient
  - Improved Textfield with CodeMirror
    - + syntax-highlighting
    - + code folding
  - Improved answer display with JavaScript and [Albertelli-EXT](#)



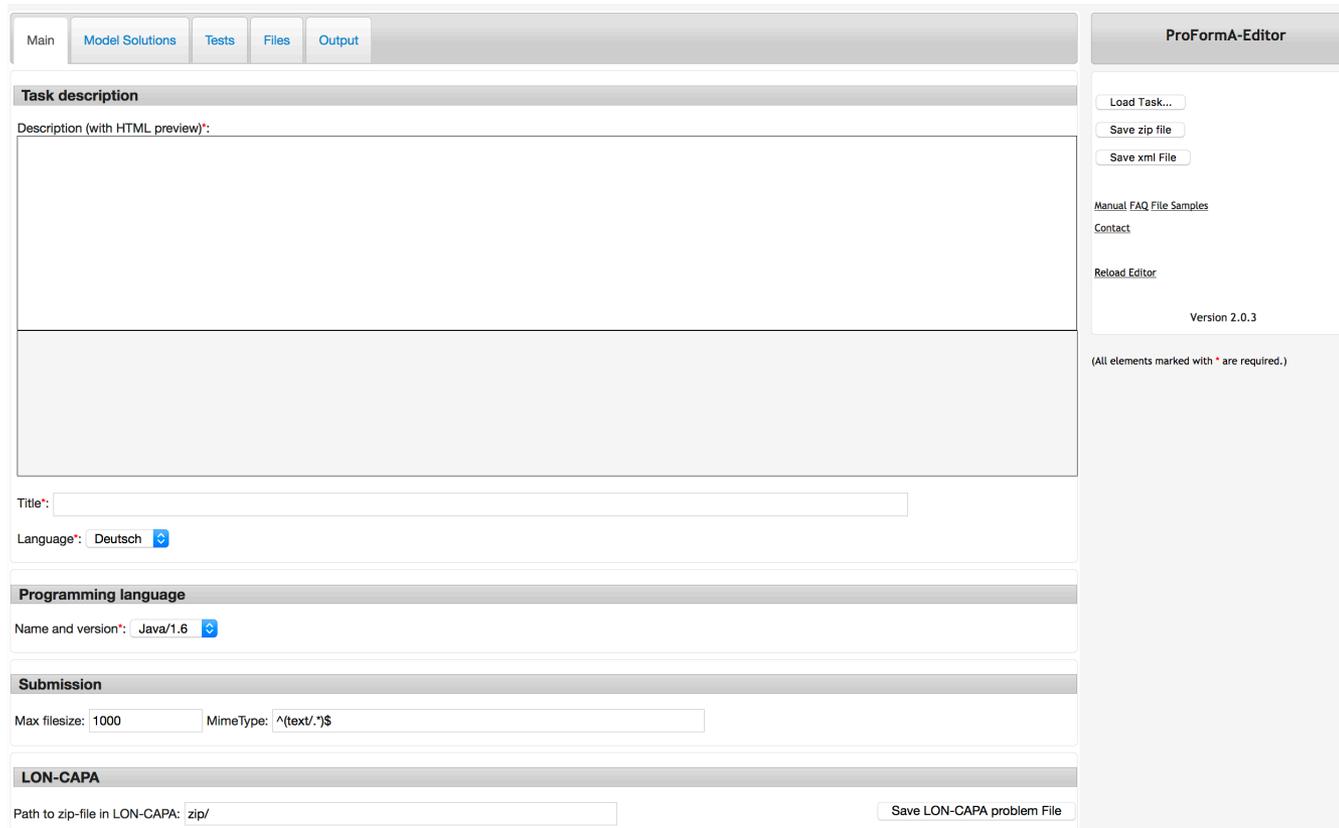
## Example: LON-CAPA and Praktomat

- **LON-CAPA** as CMS and repository
  - classlist
  - provide documents to students
  - access to programming exercises
- **Praktomat** as external grading engine
  - Java, Python, SetlX
  - test cases (JUnit, Checkstyle, etc.)
- **Editor** creating exercise Format and LC-Problem-File

# Sequence diagram



# Format editor



The screenshot displays the ProFormA-Editor interface. At the top, there are navigation tabs: Main, Model Solutions, Tests, Files, and Output. The main content area is divided into several sections:

- Task description:** A large text area for the description, with a label "Description (with HTML preview):".
- Title:** A text input field.
- Language:** A dropdown menu currently set to "Deutsch".
- Programming language:** A section header.
- Name and version:** A dropdown menu currently set to "Java/1.6".
- Submission:** A section header.
- Max filesize:** A text input field with the value "1000".
- MimeType:** A text input field with the value "^(text/.\*)\$".
- LON-CAPA:** A section header.
- Path to zip-file in LON-CAPA:** A text input field with the value "zip/".
- Save LON-CAPA problem File:** A button.

On the right side, there is a sidebar titled "ProFormA-Editor" containing the following elements:

- Buttons: Load Task..., Save zip file, Save xml File.
- Links: Manual FAQ File Samples, Contact.
- Link: Reload Editor.
- Version: Version 2.0.3.
- Text: (All elements marked with \* are required.)

-> <https://media.elan-ev.de/proforma/editor/editor.html>

# Challenges

security:

- data exchange must protect systems security and data security
- security standard for student submitted code

parameterised exercises:

- with parameterised exercises less plagiarism, but more effort required for creating exercises
- not easy implementation to make it exchangeable across LMS and grader tools



# Challenges

detailed feedback and hints:

- more feedback than pass / fail
  - release different feedback at different times e.g.:
    - code submission time, hand-in deadline or after results are published
    - challenging to format the feedback (debug output and instructor-written comments) ->
- long-term support and benefits of sharing:
  - long-term availability of the tools
  - **share the exercises** among lecturers

## Results from testing

- in operation since 2016
- small groups of students 12-16 students in two sessions in classes on introducing java
- another test with 65 students in linear algebra -> setIX
- most feedback required small changes
  - precision of the description of the exercises had to be increased
  - students had to get used to precise reading and verbatim implementation

## Results from testing

- time requirements for creating the exercises
  - 4 hours per exercises
    - improving upload mechanism for LON-CAPA
      - with prefilled data fields
      - providing semi-automated tools for generating standard tests



## Further Project Plans

- developing a response-xml ->  
<https://github.com/ProFormA/responsexml>
- connect more LMS and more grading engines
- feedback improvement
- exchange programming exercises
- resource pool for programming exercises
- testing subversion-submission with LON-CAPA



# Links

ProFormA project in github (<https://github.com/ProFormA>)

- editor
  - <https://github.com/ProFormA/formatEditor>
- exchange format
  - <https://github.com/ProFormA/taskxml>
- examples
  - <https://github.com/ProFormA/examples>
  
- Publication about XML-based exchange format
  - <https://eeced.campussource.de/archive/11/4138>

Thanks for listening.  
Any questions?

Join the workshop ;)

Website: [www.ostfalia.de/zell/elearning](http://www.ostfalia.de/zell/elearning)

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