SAUCE: A Web-based Automated Assessment Tool for Teaching Parallel Programming

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JG|U
JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Moritz Schlarb, Christian Hundt, Bertil Schmidt

Institute of Computer Science,
Johannes Gutenberg University Mainz, Germany

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Introduction

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SAUCE — System for AUtomated Code Evaluation

SAUCE

is a *language-independent*, *web-based* automated assessment tool for programming assignments in practical programming courses within academic environments like universities and schools.

Introduction

SAUCE — System for AUtomated Code Evaluation

Features

- Open source (AGPL-3.0)
- Flexible w. r. t. authentication, authorization and hierarchy
  - *Students* working in *Teams* within *Lessons* that have *Tutors*
  - Self-enrolling
  - External authentication
  - LTI tool provider
- Submission similarity calculation for plagiarism detection
- Distributed execution to support accelerators and parallel architectures

Introduction

Basic Examples — Live Demo

Hello World

- Plain old “Hello World”

Be square

- Square integers read from standard input

Technical Aspects

Technical Aspects
Web Application

Controller

- *TurboGears 2* rapid web development framework

Model

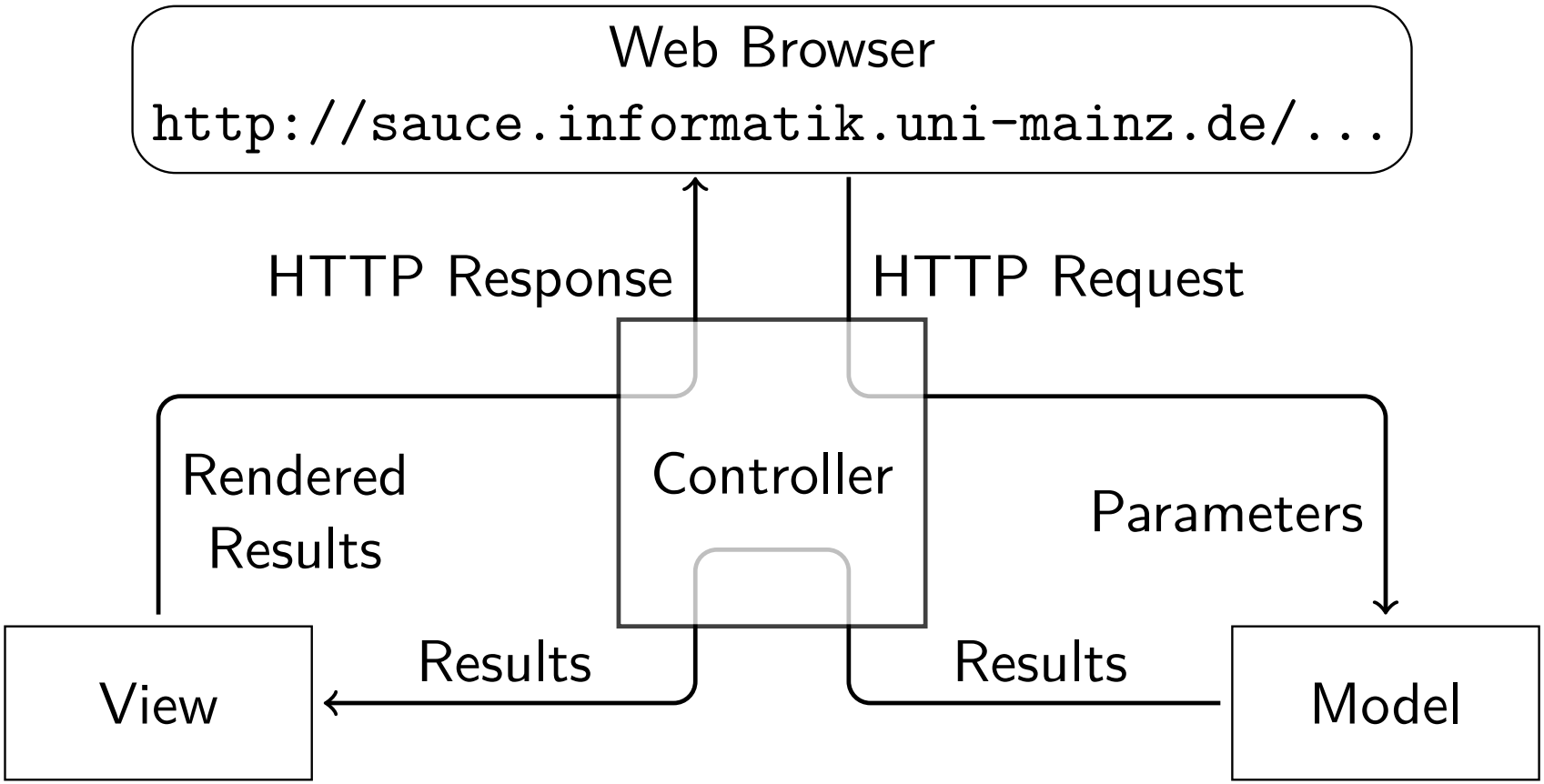
- *SQLAlchemy* object-relational mapper
  (can use any relational database)

View

- *Mako* template engine
- *Bootstrap* CSS framework

Technical Aspects

Web Application



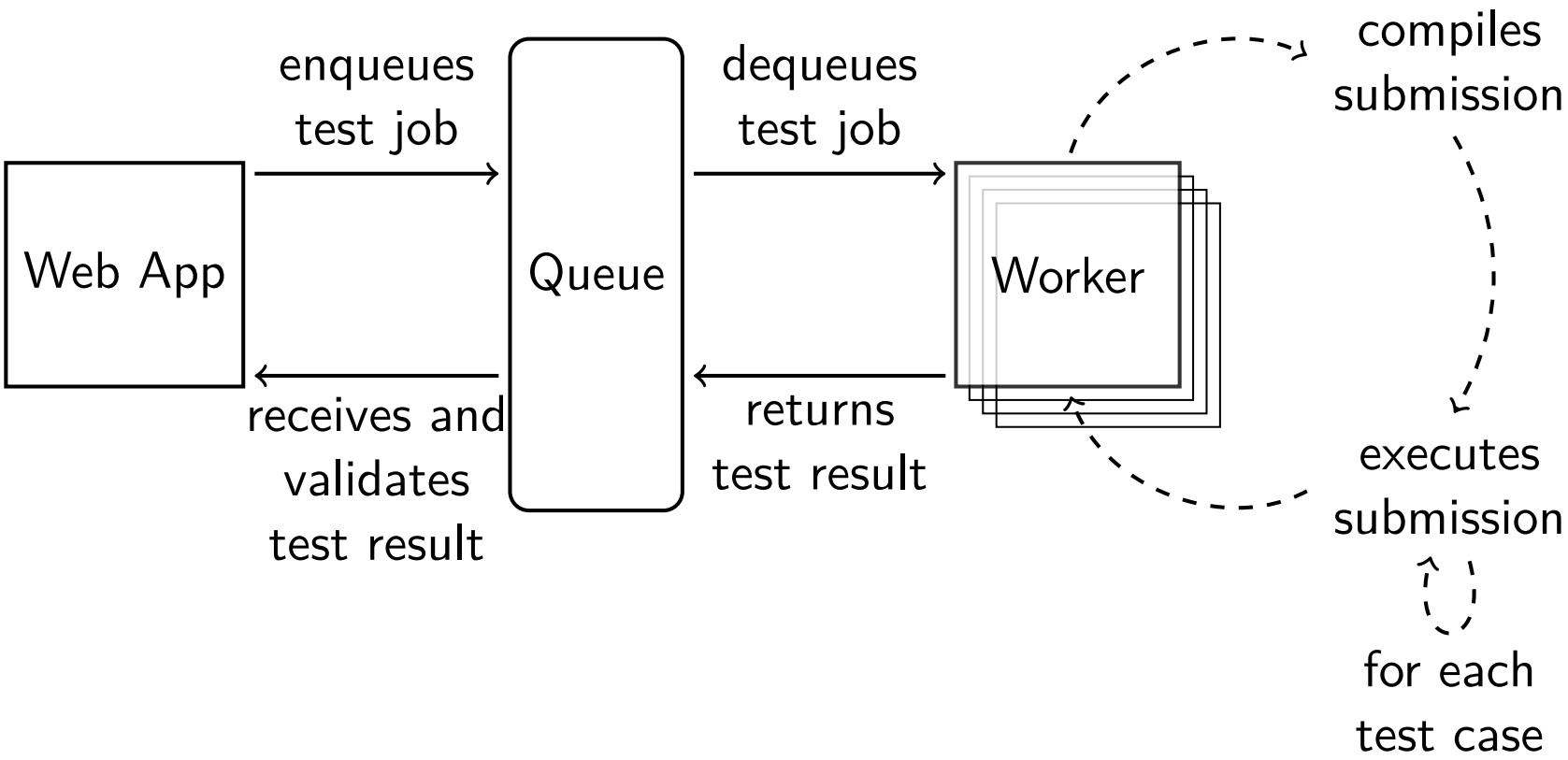
Technical Aspects

LTI — Learning Tools Interoperability

- SAUCE implements LTI specification as a tool provider
- Testing functionality can be used by other teaching platforms (e. g. Moodle or Coursera)
- Seamless user experience
  - No need to log in or join a course
  - Test result submitted back to calling platform

Technical Aspects

Distributed Execution



Use Cases

Use Cases

Parallel Programming Examples — Live Demo

Worker #1 (iaimz086)

CPU: Intel Xeon X5650
6 cores @ 2.67 GHz
with 96 GB RAM

GPU: Nvidia Tesla K40c
with 12 GB video
RAM

Software: GCC 4.8.2,
NVCC 7.0.27,
OpenMP 4.0,
OpenMPI 1.6.5

Worker #2 (iaimz105)

CPU: Intel Core i7-3970X
6 cores @ 3.50 GHz
with 32 GB RAM

GPU: Nvidia Tesla K40c
with 12 GB video
RAM

Software: GCC 4.8.2,
NVCC 7.0.27,
OpenMP 4.0

Use Cases

Parallel Programming Examples — Live Demo

Solving the Poisson Equation using MPI

- Asynchronous point-to-point communication

Odd-Even Sort using OpenMP

- Thread pool and implicit barriers

Array Reversal using CUDA

- Memory coalescence and shared memory

Thank You!

schlarbm@uni-mainz.de