Apr 11th, 11:00 AM - 2:00 PM

Gradel

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Wolf, Emily R.; Brauns, Christopher D. II; Smith, Timothy G. II; and Budd, Emmett Z., "Gradel" (2018). *The Research and Scholarship Symposium*. 17.
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School of ENGINEERING and COMPUTER SCIENCE
CEDARVILLE UNIVERSITY

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Research & Scholarship SYMPOSIUM

Gradel

Advisor: Dr. Gallagher

Symfony

Symfony is the framework we used to organize our data (the model), the website (the view) and the interface between them (the controller), following a typical MVC architecture. This is how we learned to organize our information in our classes here at Cedarville.

Model ↔ Controller ↔ View

Database

Our information is stored on Cedarville University servers, and so we need to organize it in a simple, coherent way so that requests can be fulfilled quickly and easily. We created a hierarchy of tables, of which the image below is just a small subset. This demonstrates part of our flow: Courses have Sections, which have Assignments > Problems > Test Cases.

Compilation

Code is compiled through Docker, which is third-party software that creates a safe environment for running students' code. This means we can allow students to test their code while not worrying about them accessing University records or causing mischief. Each test case is run in its own separate container, which means the code can be parallelized, which leads to even faster feedback.

What is Gradel?

Gradel is a web application that allows professors to create problems, students to submit their code, and Gradel provides instant feedback. Courses and contests are both run through Gradel, and the level of customization has allowed for great success in both areas.
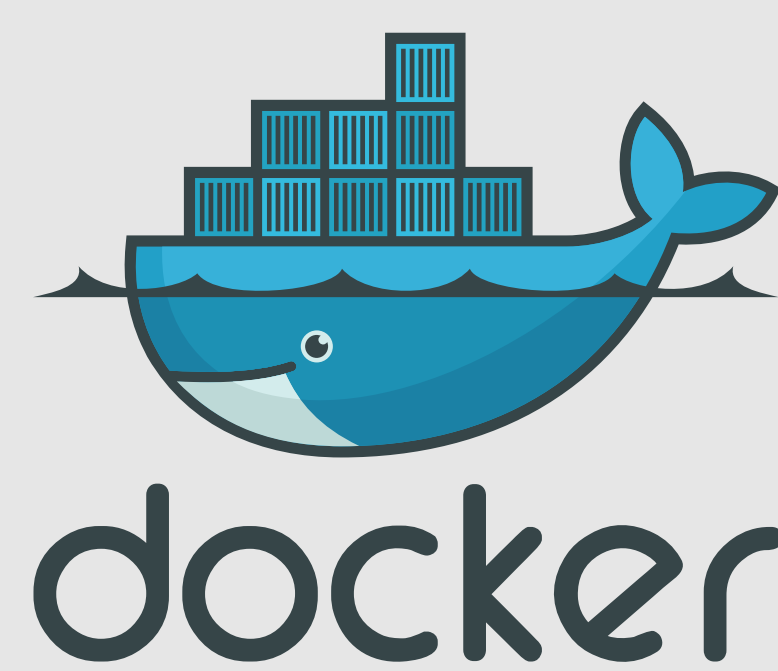
Abstract

A major problem facing Computer Science faculty members at Cedarville University is grading student assignments. Specifically, grading programming assignments can be a repetitive, time-consuming process which makes it prime for automation. Professors need a web application that takes student code, compiles it, and compares the output to what the professors provides as correct. Gradel, a senior design project, allows students to submit their code online and receive instant feedback based on professor-designed test cases. Furthermore, professors need to be able to keep track of what grades students earn on their projects, which is functionality Gradel provides. In addition to allowing professors to create courses for typical class use, Gradel also allows professors to create contests, such as the annual programming competition that takes place on campus every year. Gradel has been used for several sections of a class and this year's contest, and the results are extremely promising.
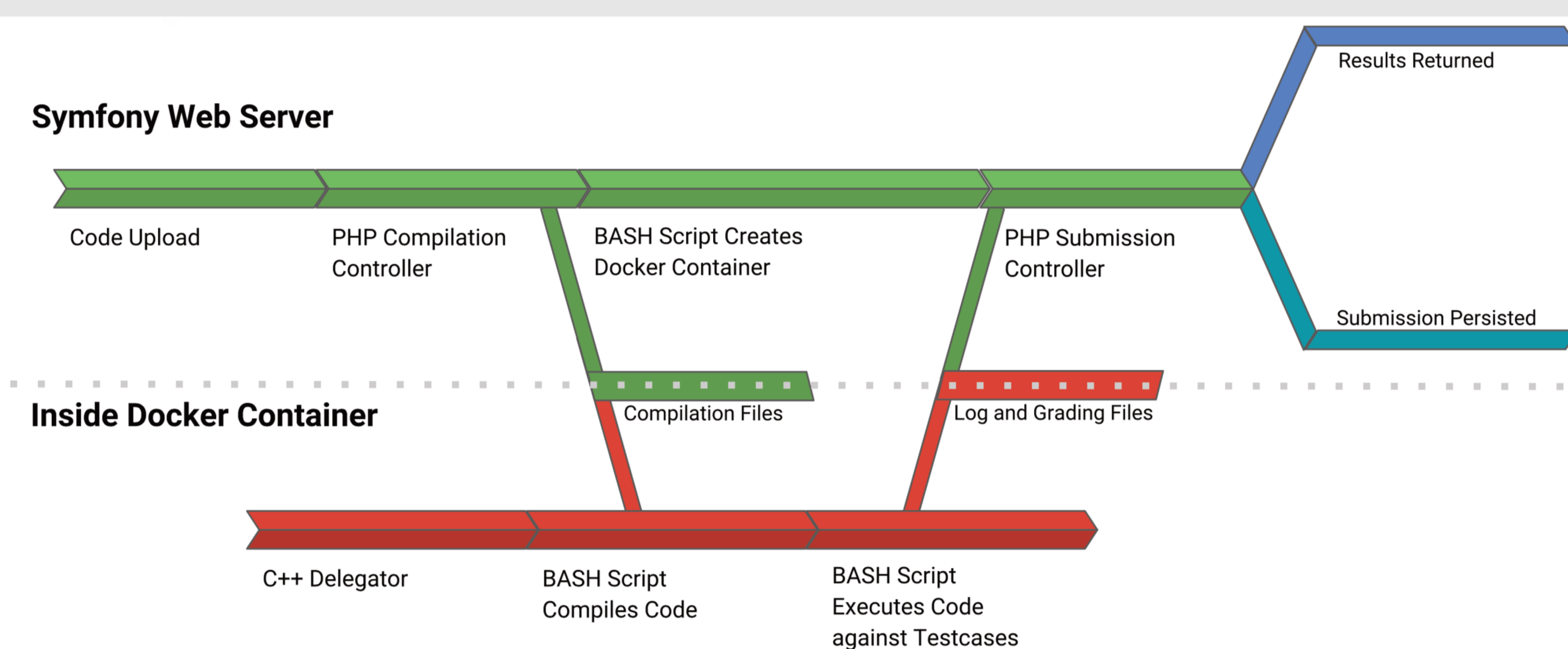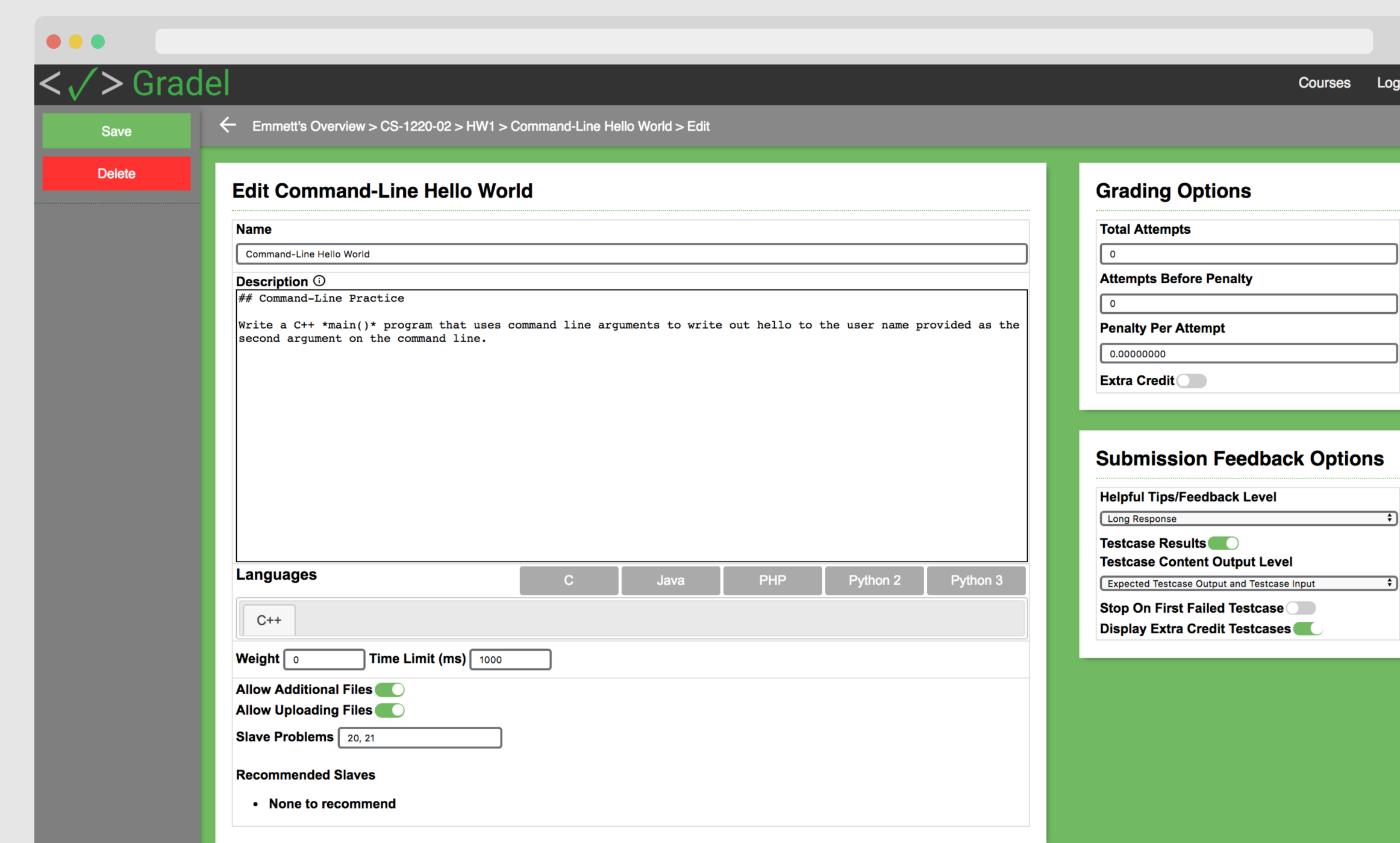
Contest Interface

This special view neatly displays the scores of a contest, updating to correctly record the current rankings. The leaderboard shown here is from this February, when Gradel hosted the annual programming contest at Cedarville. Cedarville previously had to use third-party software for contests, software that required intense set-up and preparation. Gradel has been compared to Kattis, which is software schools can use for $900 a month.

Professor Interface

When a user is logged in as a professor they are able to create and edit new classes and assignments, and add students to these classes using the student's email addresses. Once a class and assignment have been created, they can build homework problems with due dates, grading specifications, and detailed test cases that the students code will be run against. Professors are then able to view a students answers and grades and download a CSV file of their grades that can be opened in Excel. They are also able to switch to a students view so that they can more easily help students with their code.

Student Interface

As soon as a student is logged in they are presented with a listing of their classes and upcoming assignments. From here they can navigate to a particular homework problem and enter their code using ACE, a Javascript plugin that provides Gradel with a syntax highlighted code editor, or upload code files from their computer and have them automatically loaded into ACE. Clicking on the submit button will run the code against their professors test cases and give them instant feedback on their grade.