

Security Lab Manager

Developed by Simon Owens
Security Engineer

Advisor/Sponsor: Mr. Mark Randall
University of Evansville

ABSTRACT

The Security Lab Manager is a web application that manages vulnerable virtual machines for users to practice cyber security on. Users only need to login to the website to get started – no setting up environments or downloading software. Each exercise has unique answers for students – so answer sharing isn't viable. Administrators can create, edit, and view: classes, exercises, and users. Grades can be emailed out automatically.

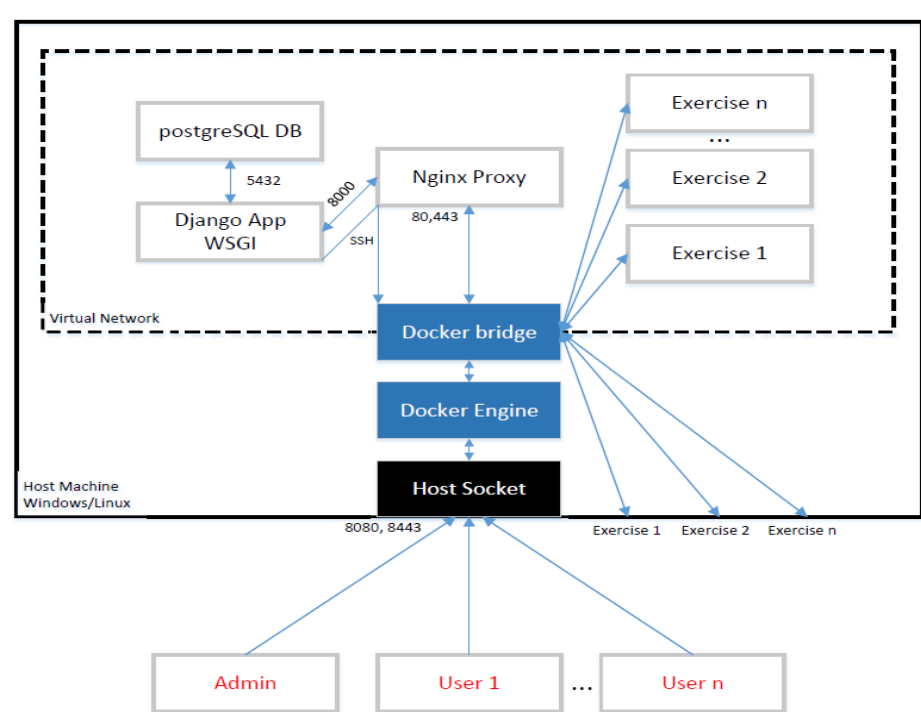
PROBLEM

Security training is desired in all parts of industry: secure coding for developers, Q/A Testers, and Security Engineers. There are several virtual machines to practice security, but none have a student-teacher model. Students can now easily begin learning security with just this application. The table below compares current options for learning security, bring your own device(BYOD), using VMware virtual machines, or this app.

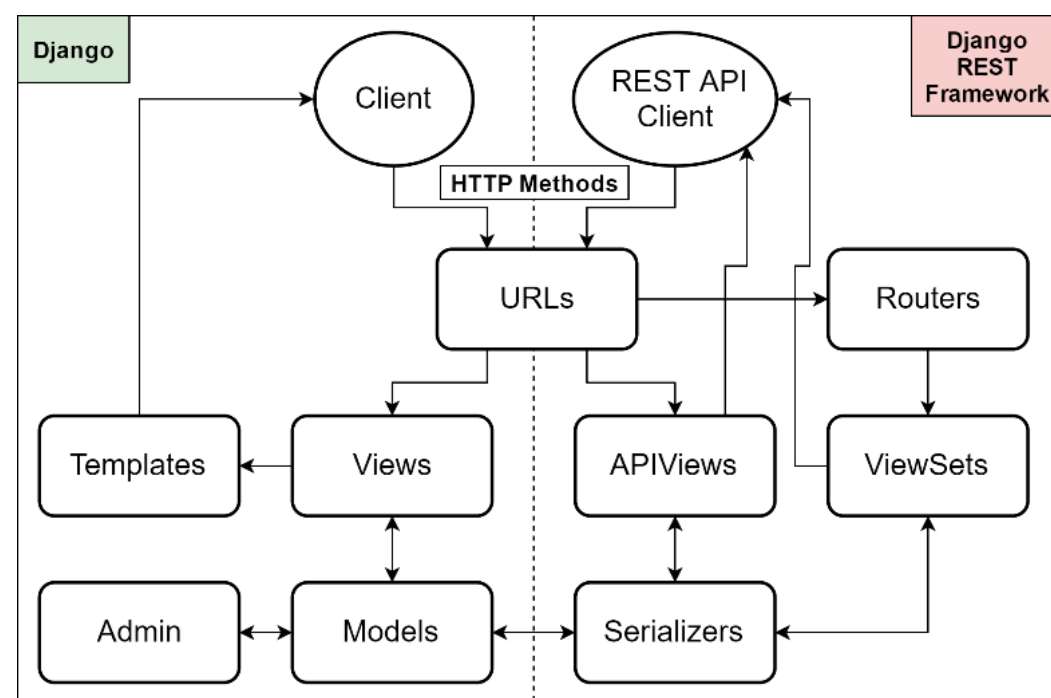
Features	BYOD	Virtual Machines	Security Lab Manager
Configured vulnerable exercises	✗	Some	✓
Downloaded/Configured debugging tools	✗	Some	✓
Cross-platform	✗	✓	✗
Exercise completion results in grade	✗	✗	✓
Unique answers to exercises	✗	✗	✓
Access Control	✗	✗	✓
Low computing resource requirements	✗	✗	✓
Requires only an internet browser	✗	✗	✓
Manage and email grades	✗	✗	✓

DESIGN

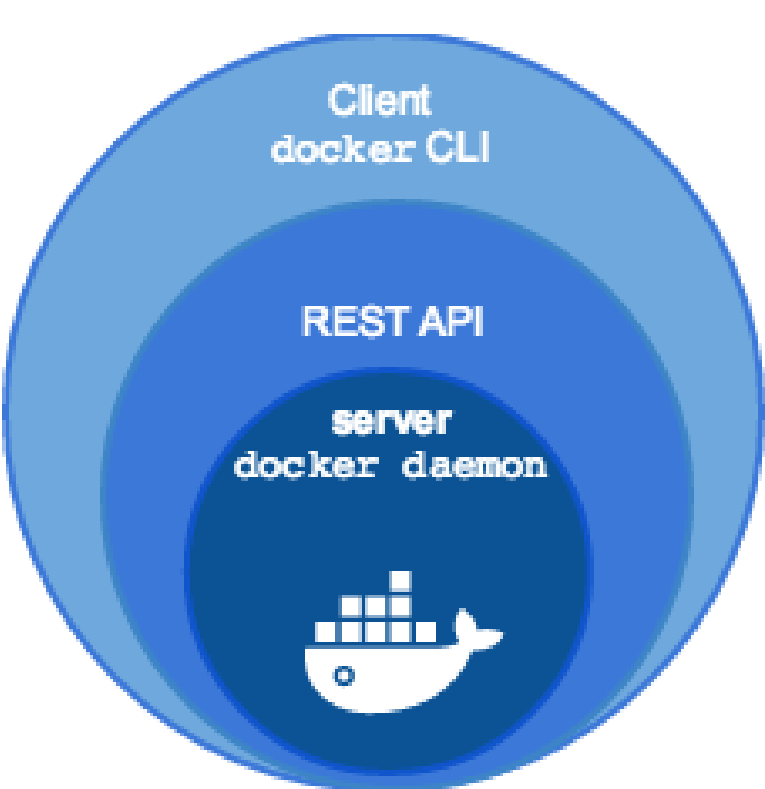
OS Level



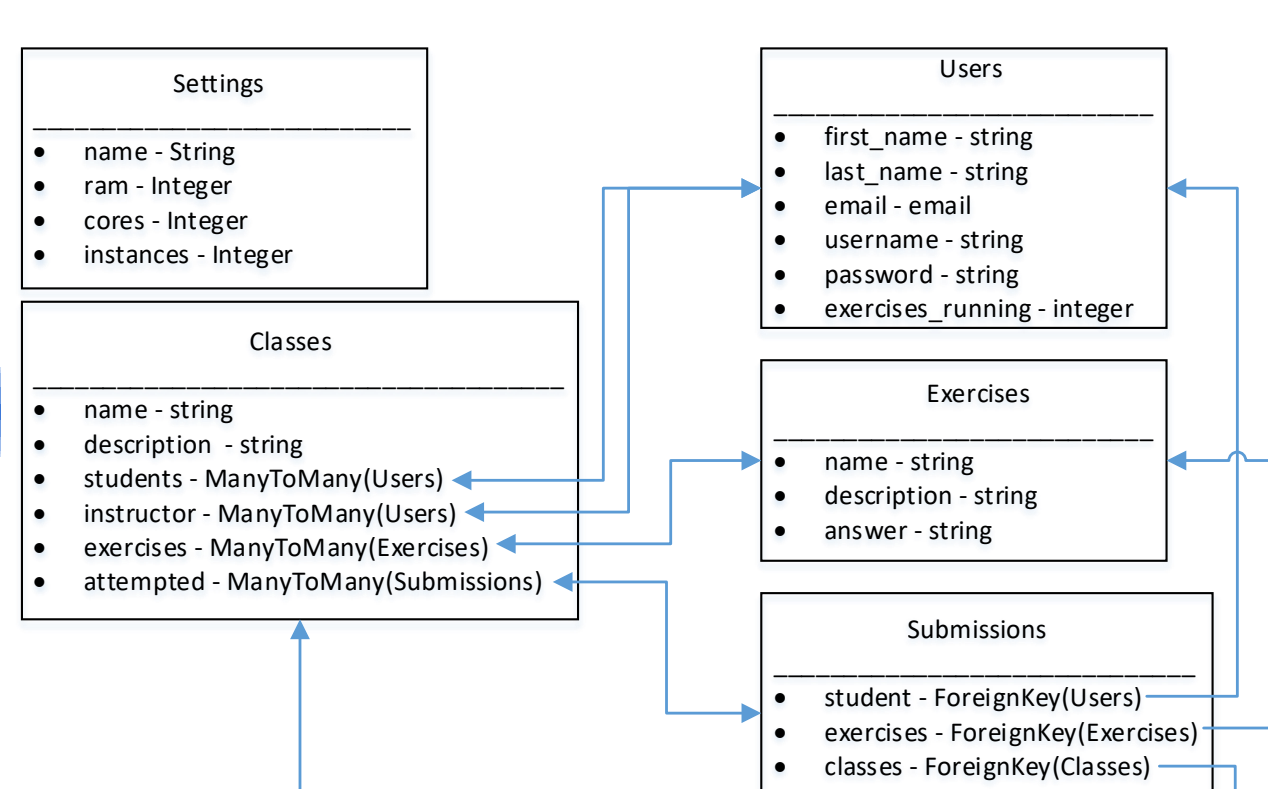
REST Framework



Docker SDK



Database



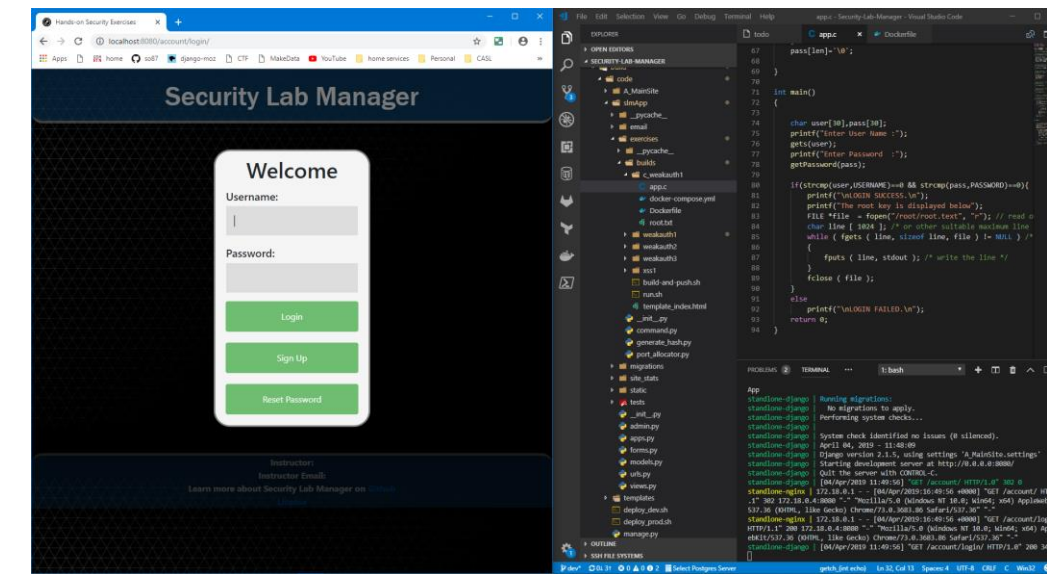
REQUIREMENTS

- Student interface for starting, stopping, and restarting exercises. There is a place to submit answers for exercises
- Instructor interface for creating, editing, deleting: classes, exercises, students, and managing application performance
- Instructors should be able to easily check and email grades
- Must contain one web security exercise
- Must contain one desktop security exercise
- Must be developed securely – scan and fix vulnerabilities
- Must be easily installed and enhanced by other developers

Secure	Efficient	Functional
There are zero vulnerabilities in Anchore, Sonarqube, and ZAP	The Docker Software Development Kit allows virtual machines to be built, started, and stopped in under 20seconds	Student and instructor tasks can be easily done in seconds through the GUI

DEVELOPMENT

VSCODE, Docker, and Chrome for development



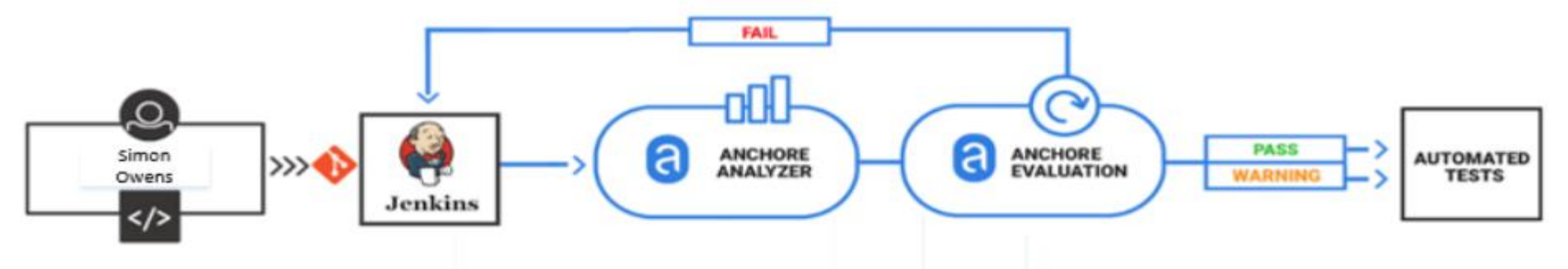
Docker SDK for Python
A Python library for the Docker Engine API. It lets you do everything the docker command-line tool does, but from within Python apps - run containers, manage containers, manage Docker, etc.

Django documentation
Everything you need to know about Django.

How the documentation is organized
Django has a lot of documentation. A high-level overview of how it's organized will help you know where to look for certain things:

- Tutorials take you by the hand through a series of steps to create a web application. Start here if you're new to Django or web application development. Also look at the "First steps" below.
- Topic guides discuss key topics and concepts at a fairly high level and provide useful background information and explanation.
- Reference guides contain technical reference for APIs and other aspects of Django's machinery. They describe how it works and how to use it but assume that you have a basic understanding of the concepts.
- How-to guides are recipes. They guide you through the steps involved in addressing key problems and use-cases. They are more advanced than tutorials and assume some knowledge of how Django works.

Jenkins runs Anchore, Sonarqube, and ZAP scans



RESULTS

- | | | |
|-----------------|---|--|
| Features | <input type="checkbox"/> Launch exercises via GUI | <input type="checkbox"/> Secure web portal |
| | <input type="checkbox"/> Automatic grading/emailing | <input type="checkbox"/> Four full virtual exercises |
| | <input type="checkbox"/> Configure all data via GUI | <input type="checkbox"/> Scales to performance needs |

Summary

The application met all requirements, is much more efficient than using virtual machines, and helps students learn security in a hands-on way.

Findings over Development

