
<Code Karin>

**<Virtual Classroom>
Vision**

Version <1.5>

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Revision History

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Vision (Small Project)

1. Introduction

The purpose of this document is to provide the professors teaching Intro to Programming courses at Texas Christian University a better understanding of the Code Karin project. Karin is designed to provide students and professors virtual classroom abilities. This includes the ability to create and delete virtual classrooms, add and remove students, add student restrictions, grade student work, add and remove problems from the problem sets: problem, solution, test set, and the ability to see a student's true name if an alias is in place. Students will have the ability to write and test code for practice problems, have access to grades, and the ability to set an alias in place of their real name. Ultimately Code Karin will be considered a success if students provide positive feedback to the product, the students engage in doing practices on the platform, the product is easy to manage by professors, if it's expandable, scalable, and flexible to be used by more users, and is secure.

1.1 Background

Our product seeks to provide a teacher-driven computer programming education platform that allows users total anonymity in communication and grading. The purpose of this software is to provide educators the ability to assign students both in class programming contests that are graded on a time-to-completion basis and to facilitate both guided and collaborative communication about programming and computer software. This product was initially designed to be used in university Intro to Programming classes where the professor recognized students were hesitant to participate due to a perceived lack of knowledge of the topic. In any situation, asking questions can be beneficial, and this platform will provide students the ability to ask their peers and professors questions without the fear of negative reflection on their knowledge or understanding.

1.2 References

AWS Documentation - <https://docs.aws.amazon.com/>

2. Business Requirements

2.1 Business Opportunity/Problem Statement

The problem of	Creating a programming language contest application
affects	Professor, Students, AWS, Developers
the impact of which is	<p>It would be helping the students gain a foundation in programming and also shines light on participating in a competitive environment along with other students.</p> <p>Another paradigm of this project is that there is anonymity between students which would not let them hesitate in either asking questions whenever they have doubts regarding a particular question from the contest.</p>

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	Along with this, it is also an application which is professor driven, rather than programmer driven. It would give both the professor much flexibility in communication, editing and running the actual code during the contest.
a successful solution would be	The professor would create a programming contest for the students in the class where everyone would be ranked according to the time they took to solve the question given.

2.2 Business Objectives

BO-1: Become recognized as a tool for TCU CS Students who could be tested on their programming skills.

BO-2: Attract many professors to implement and inculcate this system in their relatable academic class.

BO-3: Make the atmosphere of computer programming classes more exciting by introducing a leaderboard and a rewarding system.

2.3 Success Metrics

SM-1: Initial features complete with minimal bugs.

SM-2: Students provide positive feedback to the product. The students engage in doing practices on the platform.

SM-3: The product is easy to manage by professors.

SM-4: Expandable, scalable and flexible to be used by more users.

SM-5: Security.

2.4 Vision Statement

For	Academic Use
Who	Professor, and the Students in that specific class (Other professors can use it for their class respectively)
The (product name)	Code Karin
That	Create programming contests for groups of people
Unlike	Leetcode/Hackerrank
Our product	Is specific to educational institutions

2.5 Business Risks

RI-1: Infrastructure may become too expensive to maintain at large scale. (probability = 0.2; impact = 7)

RI-2: Students and universities may not adopt the software at a rate to require a maintainable product. (probability = 0.7; impact = 10)

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RI-3: Entire system could become vulnerable in an event of remote code execution. (probability = 0.1, impact = 8)

RI-4: Coming across bugs in the middle of a contest would disrupt the schedule of the class and the professor is forced to remake the questions and test cases.

2.6 Business Assumptions and Dependencies

AS-1: Students will have access to appropriate material (computer).

AS-2: Students will have up to date software on their computer to safely access the Code Karin website.

DE-1: If a student is enrolled in a class, then that student should be having an account that is able to communicate with the professor, both in conversation and in contests.

DE-2: If a student is enrolled in a class that uses CodeKarin, then that student should be able to communicate with the application to participate and compete in the contest.

3. Stakeholder Profiles and User Descriptions

3.1 Stakeholder Summary

Summary list of current and future stakeholders:

- Amazon Web Services
- Instructors
- Students
- Developers (current and future)
- Dr. Kadiyala (Product Owner)

Major value or benefit stakeholders will receive from Code Karin:

- Improved understanding of Intro to Programming for students
- Ability to perform coding contests
- Ability to compete in coding contests with anonymity
- Ability for students to practice example problems outside of class
- Increased morale among students and instructors to teach/learn
- Improved usability compared to current products

Stakeholder	Major value or benefit from this product	Attitudes	Major features of interest	Constraints	End user or not?

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Amazon Web Services	Financial profit for hosting backend systems	Strong commitment through release 2; support available throughout release 3 continued support dependent on subscription service	Cost saving by hosting infrastructure as cloud solution	None identified	No
Instructors	Increased ability to recognize students struggling with course material and provide help in a proactive fashion	Strong enthusiasm but may not be used if features are not available in an easy fashion	Increased visibility of student progress, interactive course material, increased availability of teaching resources	Training for instructors on proper setup/management of classrooms and assignments	Yes
Students	Interactive coursework that allows students to compete with each other and receive feedback/help from the instructor in real time	Neutral enthusiasm, competitive assignments might lower interest for some students, real time help from instructor might be found useful	Real time programming competitions, feedback/help provided by other students or instructor, ability to submit questions anonymously	Product is only intended for desktop computers which may cause issues for students who work primarily from a mobile device	Yes
Developers	Job opportunity, potential growth of skillset	Not happy about the software work needed, but recognizes the value to the instructors and students	Ability to create or add features to the product before release	Time needed to become familiar with tools needed for product, features to add dependent on client approval	No
Dr. Krishna Kadiyala	Intellectual property ownership of product, potential ability to sell product	Strong enthusiasm, original creator of product	Creation of product, IP capital	features subject to Dr. Kadiyala's approval as the product's client	Yes

3.2 User Environment

Details of the working environment for the target user:

1. The number of individuals involved in completing the coding competitions will be the entire Intro to Programming class and any instructors involved in the teaching process. As the students will be tested and the instructors will conduct.
2. Each task cycle is dependent on the coding question asked. A rough estimate would be 5-10 minutes per question.
3. Unique environmental constraint is the users must have access to a computer and wifi.

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4. Currently the system platforms this program will be available on is MacOS and Microsoft Windows. There have been no current plans to expand to more platforms as these are the platforms currently used in Texas Christna University's classes.
5. Currently there are no other applications needed for Code Karin so no application integration is necessary.

3.3 Summary of Key Stakeholder or User Needs

Need (Job to be done)	Priority (H i g h , M e d i u m , L o w)	Concerns	Current solution	Proposed solution
Instructor: Needs a way to view student progress in real time	High	Ability to view student progress quickly helps prevent grades from falling	Watching students work in class individually and assisting them one at a time	Real time programming competition that allows for instructor feedback
Student: Needs a way to view their results after the contest	Medium	Ability to view their own grades helps them to see where they are not performing well.	Wait for a day or two for the grades to be released by the instructor, after reviewing the number of test cases passed out of the total.	The students communicate with the instructor to view their grades.

3.4 Alternatives and Competition

AC-1: Leetcode: A platform for students to complete challenges similar to CodeKarin but it only lets the users practice Data Structures and Algorithms, and there is no classroom setting.

- The main weakness is that this is not a tool that promotes communication between the student and the professor, and this is not a tool that helps students to have a better classroom understanding.
- This tool cannot be used for a group of people, which is one of the main goals of CodeKarin.

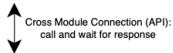
AC-2: Hackerrank: A platform similar to AC-1 where individuals can practice data structures and algorithms, and also take exams (please note that the exams are not the same as a programming contest).

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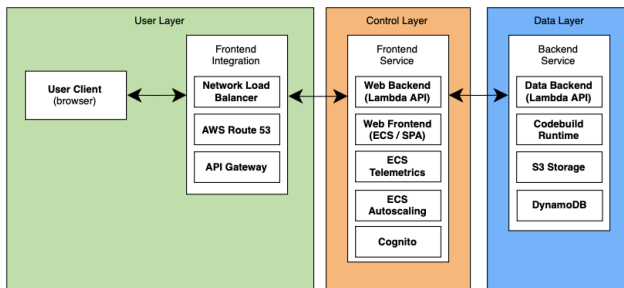
- The main weakness is that this is not a tool that promotes communication between the student and the professor, and this is not a tool that helps students to have a better classroom understanding.
- Another weakness is that this tool cannot be used for groups of people who can be assigned a single problem, to be solved that gives out a leaderboard.

4. Scope and Limitations

4.1 Product Perspective

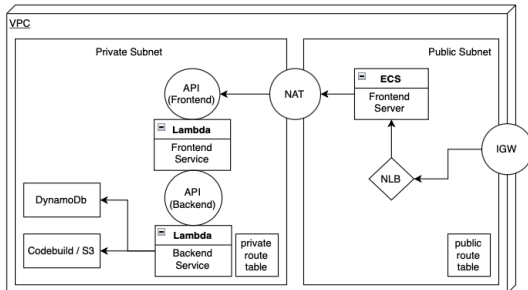


Layered Architecture



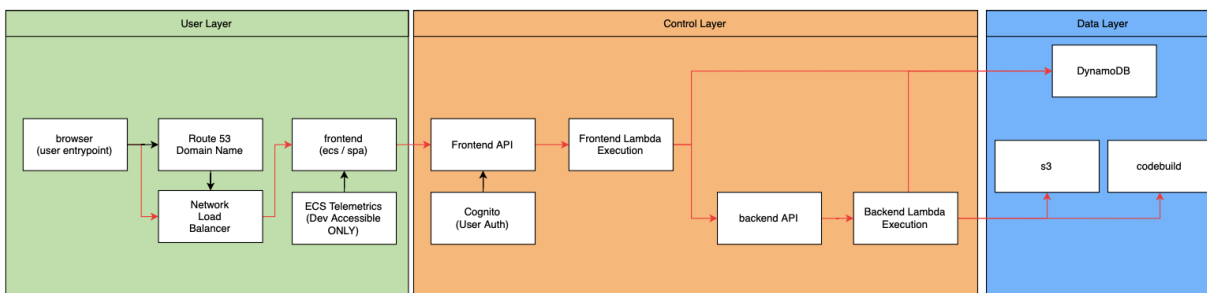
AWS VPC Diagram

The following is a proposed design for Virtual Private Cloud architecture on AWS. The VPC diagram entities correspond to the entities in the Black Box Diagram with a little more information about hosting technologies used.



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Container Diagram



4.2 Major Features / Scope

Major features present in Karin will allow:

Instructors to manage virtual classrooms involving the ability to:

- create and delete virtual classroom
- add and remove students
- add student restrictions
- Grade student work
- Add and remove problems from the problem set including:
 - Problem
 - Solution
 - Test Set
- The ability to see a student true name if an alias is in place

Students will have the ability to:

- Create a student account with the available features:
 - Access the virtual classroom (if applicable)
 - Write and test code for practice problems
 - Have access to grades
 - The ability to set an alias vs real name

Instructors and students will also have the ability to run code anywhere at any time and receive real time feedback. Open channels for communication will also be present. This would allow instructor and student to communicate privately as well as an open discussion board for the class.

4.3 Deployment Considerations

DC-1: All the students need to be in the same classroom in order to participate in the programming contest.

DC-2: The professor decides who can and cannot take the contest, and the prerequisite condition is DC-1.

DC-3: All the students need to be enrolled in the course in order to be able to participate.

DC-4: All the students inside the classroom should have a stable internet connection.

DC-5: The application needs to be running during the course of the competition.

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5. Other Product Requirements

Amazon Web Services are required to access Code Karin and compete in coding contests. The quality range for performance, robustness, fault tolerance, and usability are extremely high for AWS. The only design constraint found are the microservices which can be tedious to work with. The only thing necessary to access Amazon Web Services is a valid account. Amazon has user-friendly manuals and online help which can be found at AWS documentation - <https://docs.aws.amazon.com/>. AWS was picked for Code Karin because of its usability, scalability, and stability which are all important factors to make Code Karin successful.