Lab 2 - Product Specification Outline

CS 411W Lab II

Product Specification

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Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 Purpose

Inclusive Classroom's (IC) primary goal is to increase the accessibility of online learning to low-income students. The solution is a two-pronged approach. The two primary sections will be the student-side flow and the teacher-side flow. The student side will have the ability to passively download and upload, both assignments and lectures. The product will attach a timestamp to completed assignments to enable teachers to determine whether an assignment has been completed in time. The major goal of the teacher-side flow will be to allow the teacher to interact with these students with as little headache as possible. This will be done by automating processes for uploading lectures and sending notifications of live stream status to students. The teacher will also be able to easily review the timestamp associated with the assignment.

1.2 Scope

The Inclusive Classroom (IC) software will have key features and capabilities that distinguish it from the rest of the competition. The biggest concept behind IC is the idea that many students learn in environments without stable internet connections. The client app of IC will be able to operate completely without the internet. If the software is set up by the school or parent(s) with internet access, the student can, in theory, go the entire year without internet until the last day. All teaching materials can be prepared beforehand, and the software will manage all submissions, lectures, etc. to keep the student on pace. If the student can access the internet intermittently throughout the year, the software will automatically synchronize with the backend server, submitting the assignments as if the student had submitted them with internet access the entire time.

At the beginning of the school year, teachers will be able to plan out the entire year, including all lectures, assignments, quizzes, exams, class updates, etc. When the student client software is first set up, it will load all the preplanned data and manage it on the client-side. The student will then be able to follow through with the class in the manner the teacher-designed it. Students will be able to watch the lectures at their own pace, or at the pace deemed by the teacher. Students will be able to complete assignments as they open (weekly, for example), submitting them with or without the internet. As internet is not required through the year, there will be no degradation in student experience. Inclusive Classroom will allow students in areas without internet access, or limited internet access, to learn effectively. If the teacher cannot plan out ahead of time for the whole year, the ability to add in assignments on a weekly basis will help students with limited internet access obtain their needed assignments.

The software will also be available on nearly all operating systems and computers. It will support Chromebooks, as well as the main three operating systems, Windows, Mac OS, and Linux. By supporting these, IC will be an option for nearly all school systems across the United States.

1.3 Definitions, Acronyms, and Abbreviations

High-speed Internet: Internet with consistent download speeds of at least 3.8 Mbps (Zoom)

English as a Second Language (ESL)

Family Educational Rights and Privacy Act (FERPA): Federal law that protects the privacy of student education records

Google Classroom: "Free web service developed by Google for schools that aims to simplify creating, distributing, and grading assignments" (Google)

littleLearners: Former CS 410 group solution that emphasizes simple UI for students in the K-5 age range (Del Razo)

Stable Internet: Internet with less than 1% dropped packets (ICTP)

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1.5 Overview

The remaining portions of the product specification will detail the various requirements, features, architecture, and projected capabilities of the Inclusive Classroom prototype. Section 2 will focus on the prototype architecture, featuring explanations of functionality and descriptions of the various external and internal interfaces. Section 3 will be in a different document and will contain the prototype specification requirements.

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2 General Description

2.1 Prototype Architecture Description

Inclusive Classroom consists of two main components. The client application is utilized by teachers and students. The API handles communication between the client and external databases.

- API: handles all client connections. It will be built with Node JS, Express, Postgres, and Redis. It will handle saving videos to the database, uploading assignments, downloading assignments, getting assignment lists as a priority queue, handle user authentication, and send push notifications. The API will allow for the client application to communicate with the remote database as well as handle user authentication.
- Client-side Application: serves as an interface between the end user and the API as shown in Figure 1. Teachers and Students will utilize the application. A simple and intuitive interface will allow for efficient end-user interaction with the application. The application will be based on a React Native application with an SQLite store. The SQLite store will facilitate viewing of live stream and recordings, recording of live streams, uploading of live streams, downloading/uploading of assignments for Teachers and students, management of classes, and assigning/uploading of grades for assignments.

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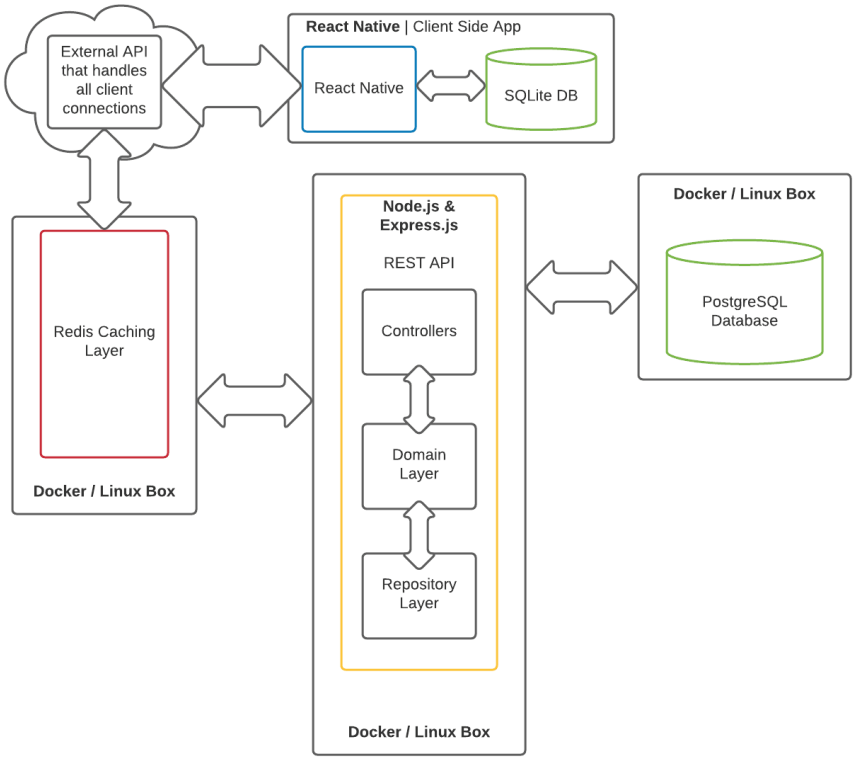

Figure 1: MFCD

2.2 Prototype Functional Description

The prototype will include many of the core features, Table 1, of the overall design, focusing on the application and the API. Emphasis will be placed on the automation aspects of the proposed solution with inclusion of a weighted priority queue for assignment downloads, automatic detection of internet, and automatic submission of assignment when internet access is obtained the prototype will implement the following views in order demonstrate the desired automations: student dashboard teacher dashboard, login screen, assignments, and a video conference screen. The technology used in the construction of the prototype will be the same as the real-world product (RWP).

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Table 1: Feature comparison of RWP and Prototype

Feature	**RWP**	**Prototype**
Account Roles	Student, Parent, Teacher, Admin, IT	Student, Teacher, Administrator(limited) only
Automatic Internet Detection	Yes	Yes
Background Workers	Yes	Partial
Complete/Submit Assignments	Yes	Yes
Create Assignments	Yes	Yes, limited in types
Grade Assignments	Yes	Yes
Postdate created content	Yes	No
Recorded Videos	Yes	Yes, may not auto record
Reporting	Yes	No
Timestamp Completed Assignments	Yes	Yes
Video Conferencing	Yes	Yes
Weighted Priority Queue	Yes	Yes

The Inclusive Classroom prototype will be designed with individualized features for teachers and students each in mind.

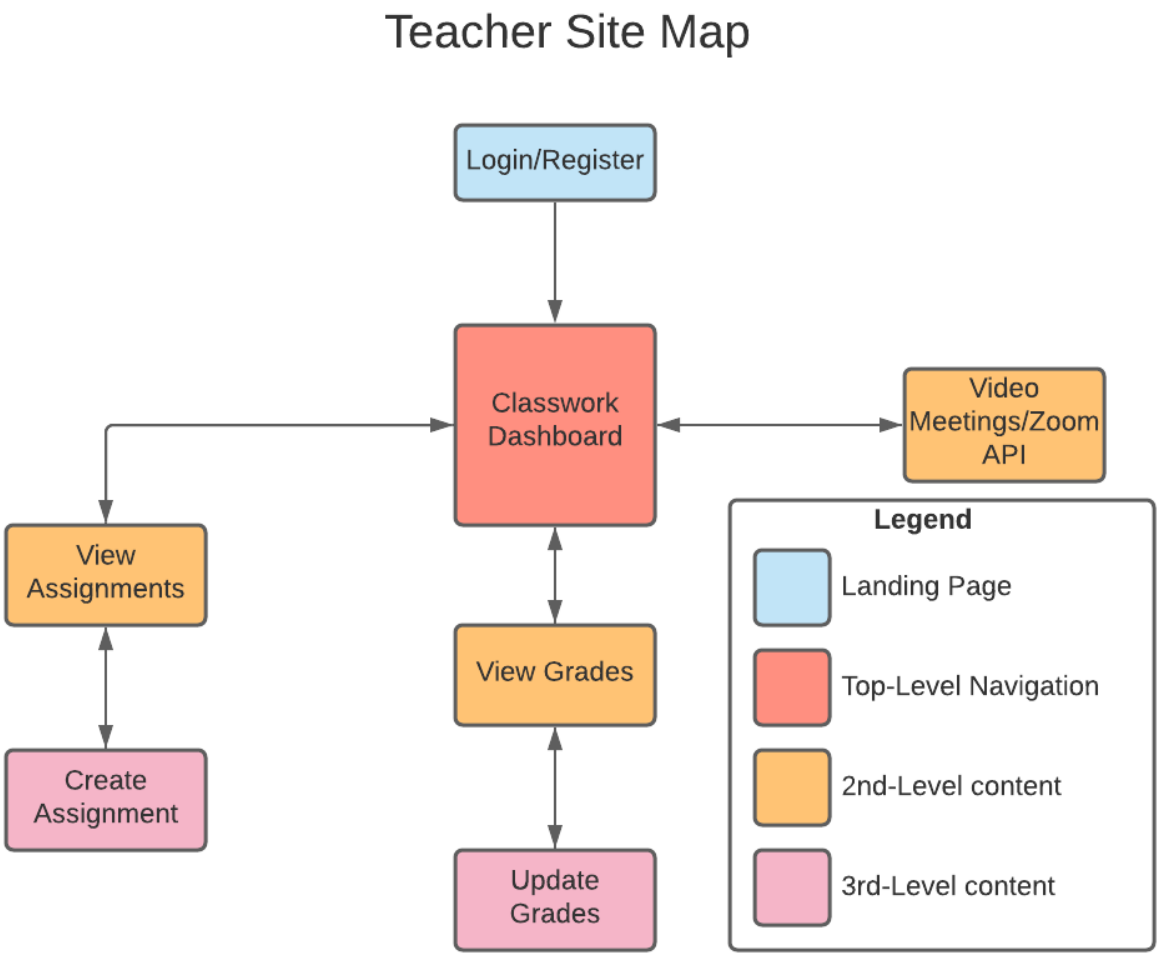

Figure 2: Sample Teacher Site Map

Teachers will be able to create classes, add students to classes, create assignments, schedule zoom sessions, and open zoom sessions for students to join by navigating the client-side application as shown in Figure 2. Scheduling and opening of zoom sessions as well as recording them will take place in the Video Meetings/Zoom API section. Teachers will be able to create and view assignments by accessing their respective views from the Classwork Dashboard.

Teachers will then have the ability to view and update grades by navigating to the respective views from the Classwork Dashboard.

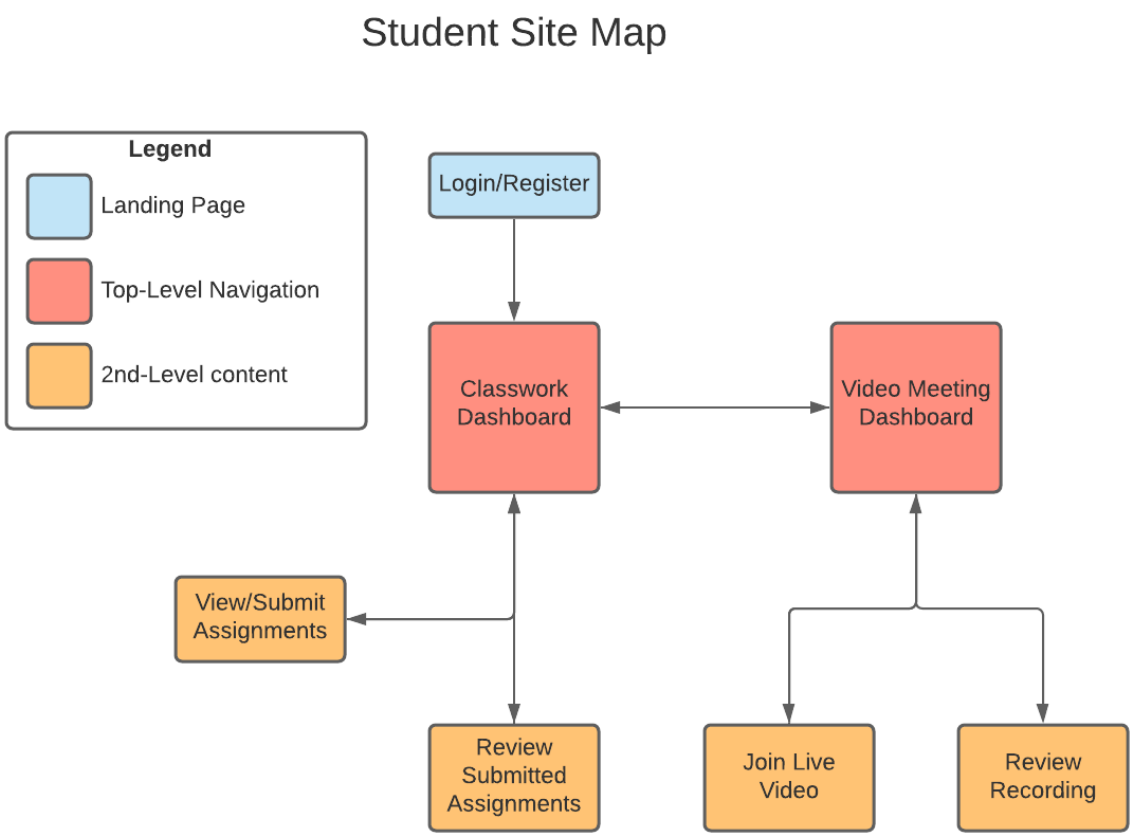

Figure 3: Student Sample Site Map

Students will be able to view the classes they are in, view their assignments, make submissions to their assignments before the due date, and watch a lecture live or view the recording afterwards as shown in Figure 3. All sub-views will be accessible via the Classwork Dashboard. The Classwork Dashboard contains access to viewing or submitting student assignments as well as the ability to review previously submitted assignments and see feedback for them. The Video Meeting dashboard can also be accessed from the Classwork Dashboard. From the Video Meeting dashboard, students can join live video sessions as well as access and

review downloaded class recordings. In addition, teachers and students will share the ability to create accounts and login.

2.3 External Interfaces

The Inclusive Classroom prototype will use hardware, software, and user interfaces to interact with the underlying program and demonstrate functionality.

2.3.1 Hardware Interfaces

Users will need a stable machine which possesses Windows 10, Mac, or Chromebook to host the client app. A stable internet connection will be required to download the Inclusive Classroom prototype.

2.3.2 Software Interfaces

Users will need Windows 10, Mac, or a Chromebook in order to run the application.

2.3.3 User Interfaces

Users will be able to interact with the Inclusive Classroom interface by using a computer screen, keyboard, and mouse. The computer screen will display the application once they have downloaded and launched the application. The keyboard will be used for entering data throughout the program. Examples of data entry include the user login entry and students entering answers to questions for assignments they are given. The mouse will be used for selection and navigation throughout the program.

2.3.4 Communications Protocols and Interfaces

The Inclusive Classroom software will communicate with the API via the HTTP standard, starting with RFC 2068 and subsequent updates.