

Lab 2: Inclusive Classroom Product Specification

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Version 1

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[TO BE FINALIZED AS SECTIONS ADDED]

### Introduction

Inclusive Classroom attempts to address pertinent issues related to remote learning in K-12 students. Over the COVID-19 pandemic, underprivileged students experienced a disproportionate level of disparities surrounding remote education. In fact, according to a 2020 study, nearly 60% of students face issues impacted by inadequate internet connection (Vogels, 2020). The Inclusive Classroom platform adds a level of security for students who lack available and consistent internet. On the teacher side, new and emerging remote learning platforms only confabulate remote instruction. The Inclusive Classroom application offers both student and teacher ease of access for the global benefit of education. The current Assignment Process Flow and Live Video Process Flow in Figure 1 and Figure 2 outline the proposed solution to the previously depicted problem

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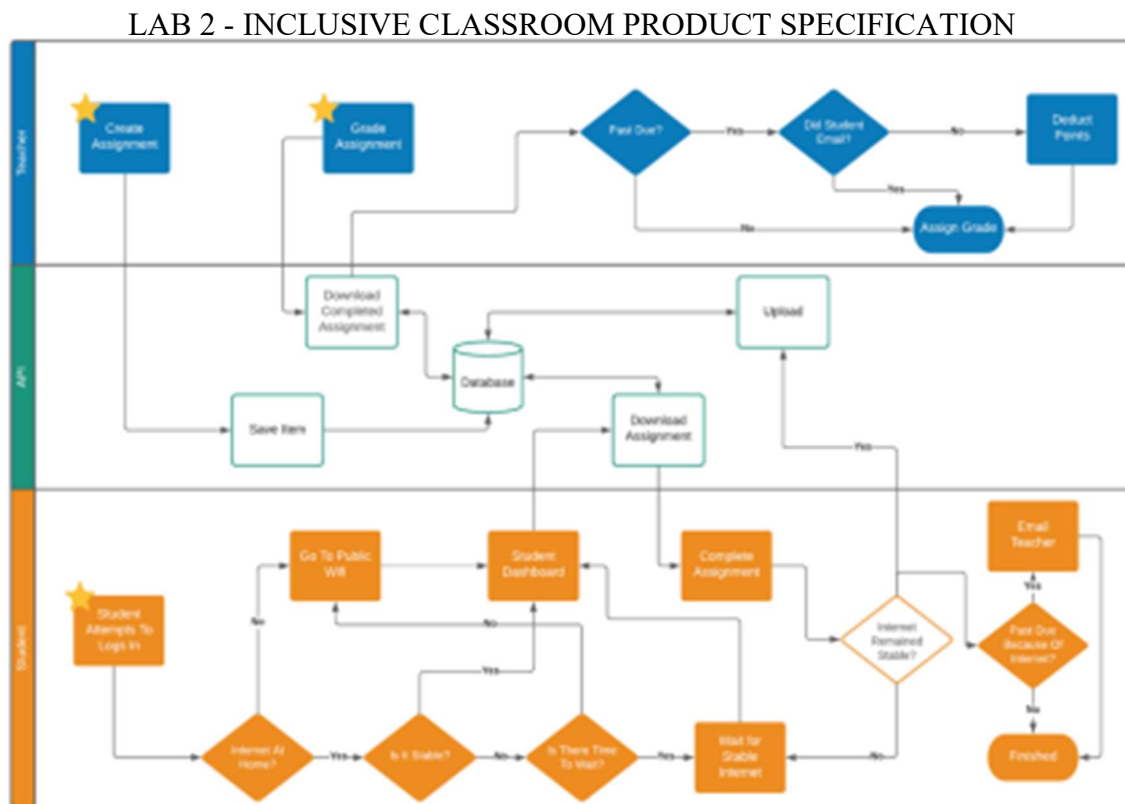


Figure 2: Current Assignment Flow

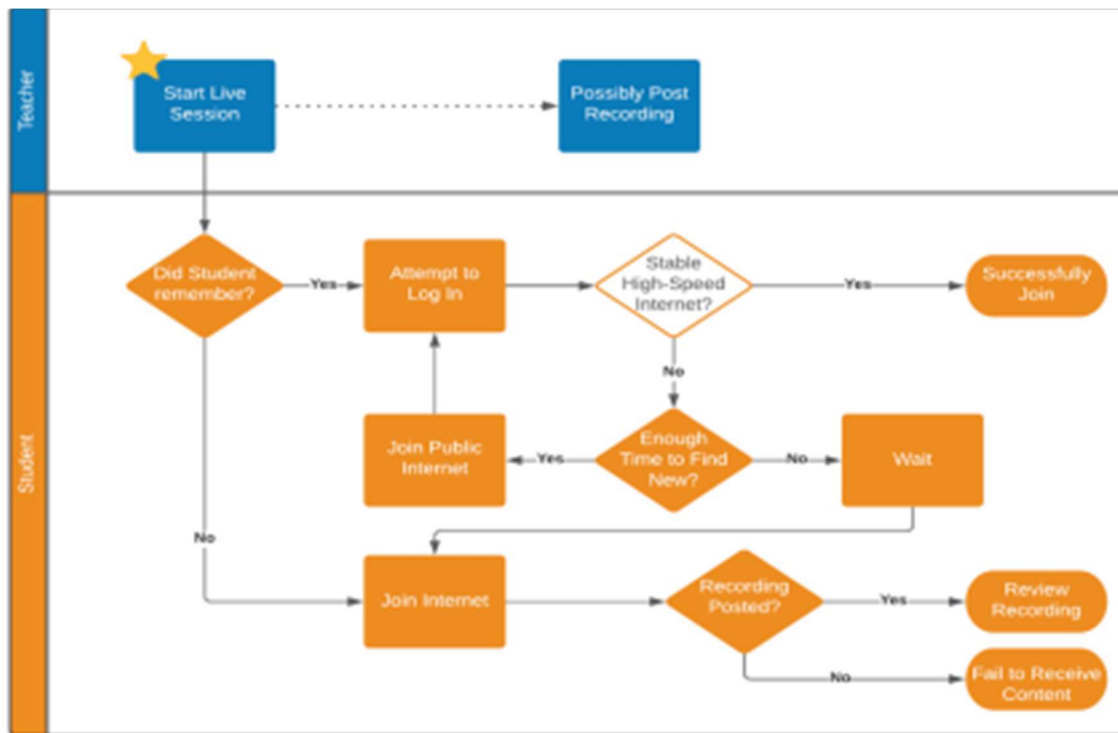


Figure 1: Current Video Flow

## LAB 2 - INCLUSIVE CLASSROOM PRODUCT SPECIFICATION

### Purpose

The Inclusive Classroom application will offer a simple user interface for both student and teacher users. A high level of automation will increase ease of access for uploading, downloading, zipping, and unzipping files. Convention over configuration is emphasized to ensure simplicity for all users. Most importantly, Inclusive Classroom will offer novel solutions to the internet connection disparities across the United States. In addition, the Inclusive Classroom application will support all three major operating systems to ensure accessibility. Though accommodation of both teachers and students, IC will enable greater remote learning participation as described in the Inclusive Classroom Solution Process Flow (Figure 3).

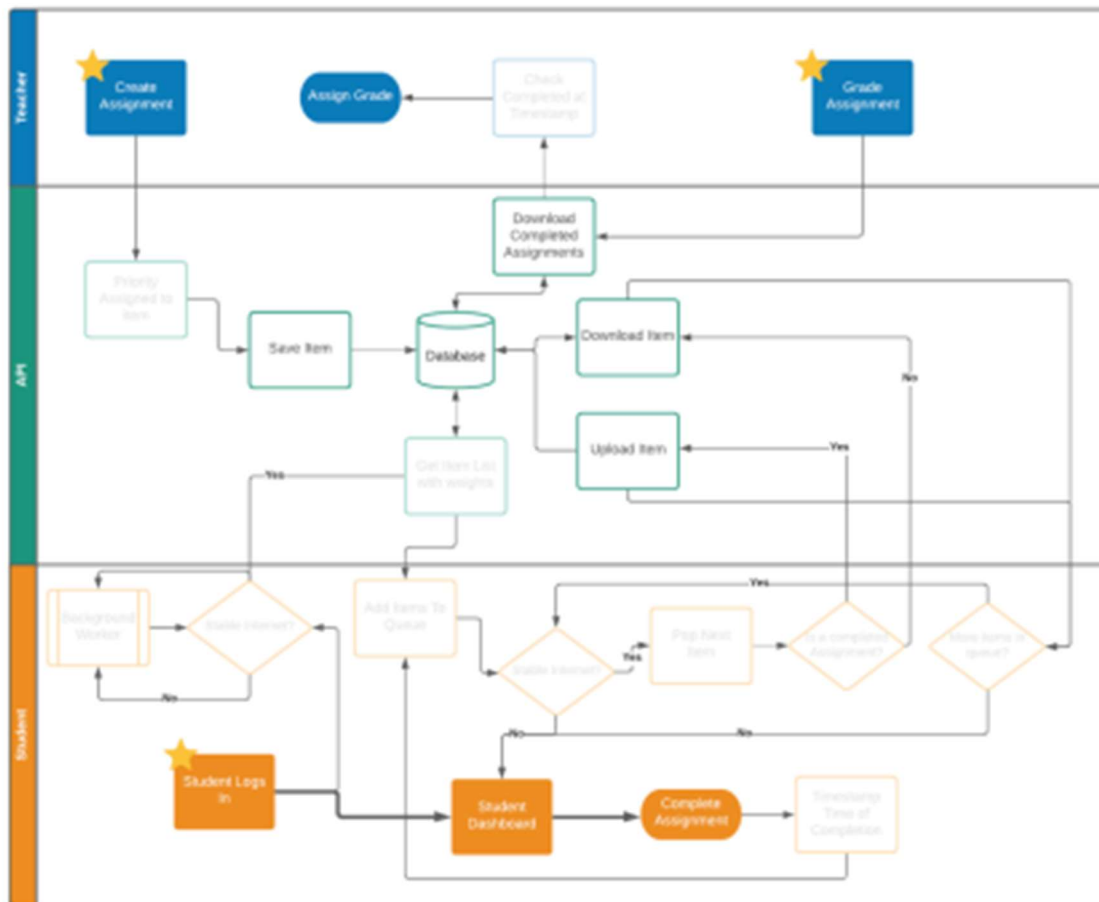


Figure 3: Solution Flow - Assignments

## LAB 2 - INCLUSIVE CLASSROOM PRODUCT SPECIFICATION

### Scope

Inclusive Classroom's scope encompasses both student and teacher users. The target audience is a K-12 child

experiencing in a non-traditional remote learning environment. On the instructional side, teachers will be accommodated through ease of access function ability. To increase time spent in education, Inclusive Classroom directly works to automate file uploads and downloads, data management, and class scheduling. The native application best demonstrates the key features of the proposed software. This native application will best emphasize the teacher and student experience of the application. Although the Inclusive Classroom prototype will not have the same operational functionality as the real-world product, the prototype will demonstrate classroom accessibility on a topical level.

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## LAB 2 - INCLUSIVE CLASSROOM PRODUCT SPECIFICATION

### **Definitions, Acronyms, and Abbreviations**

**ESL** - English as a Second Language

**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)

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

**HTTP** – Hypertext Transfer Protocol

**IC** - Inclusive Classroom

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

**ORM** – Object-relational mapping; programming technique for converting data between incompatible type systems

**RFC** – Request for Comments; a formal document from the Internet Engineering Task Force  
Stable Internet - Internet with less than 1% dropped packets (ICTP)

**UI** - User Interface

## LAB 2 - INCLUSIVE CLASSROOM PRODUCT SPECIFICATION

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## **Overview**



Inclusive Classroom includes unique hardware and software components. The following information specifies the conditions used to control, manage, and establish each feature. The performance of each feature including outputs, displays, and user interfaces are described in the requirements section. In addition, the expectations of the finished prototype are listed.

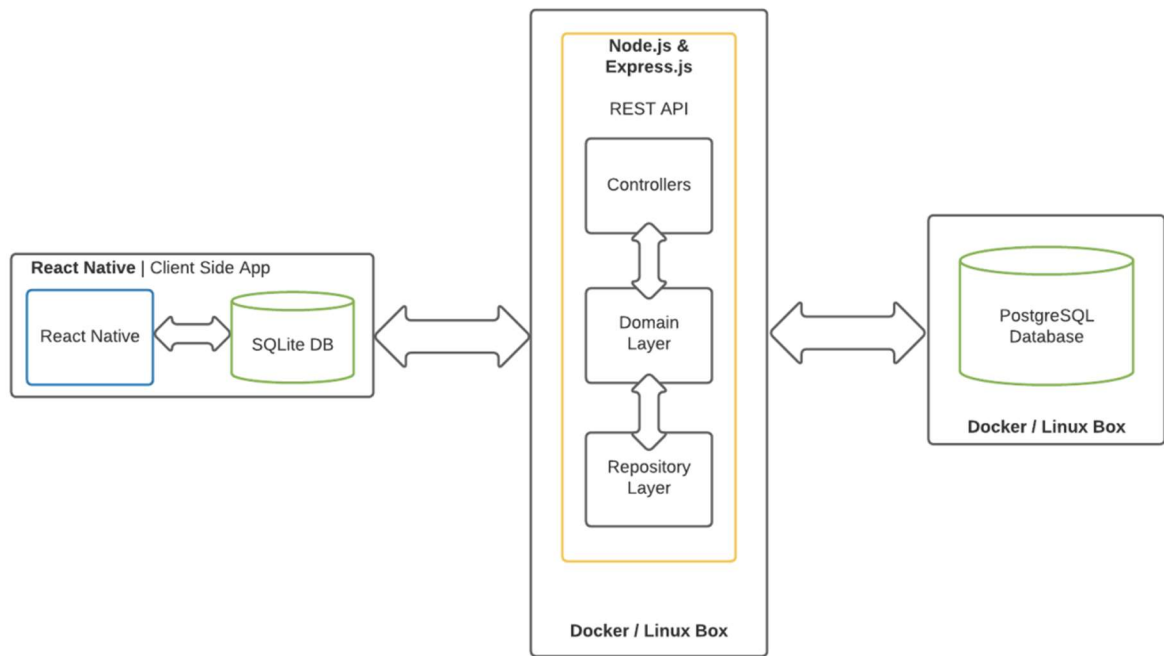
## **2 General Description**

Inclusive classroom is designed to address current issues with virtual learning. The native application will mitigate internet connectivity issues experienced by disenfranchised K-12 students. The teacher component accommodate uploaded lesson plans, class timelines, recorded and uploaded lectures, and assignment management. Administrators will have a distinct ability to manage both teacher and student capabilities from a management standpoint.

### **Prototype Architecture Description**

Inclusive Classroom's client application will serve as an interface between the user and the API. Students, teachers, and administrators will require authentication. Teachers will authenticate via username and password. Students will authenticate via tokenization on their school assigned hardware.

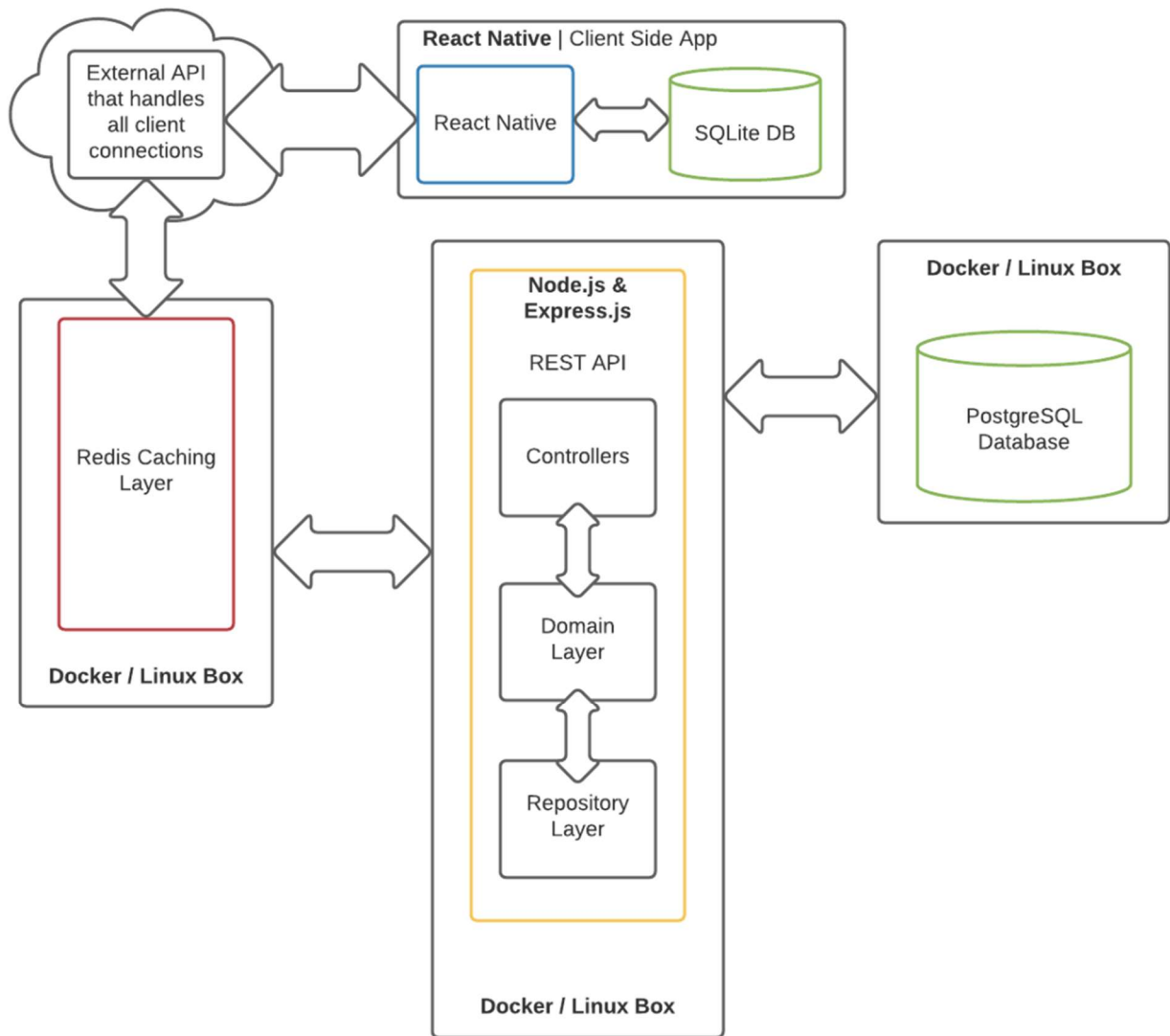
React Native will be used to develop the native application for mobile devices. The data will be stored locally using React. The API will manage data through a SQLite3 database instance stored locally. All data including assignments, video streams, class data, and assignment grades will be stored using this mechanism. This breakdown is visually outlined in Figure 4, "Client Side App."



*Figure 4: Prototype Component Diagram*

The API of IC functions as the central repository for all data stored in operation of the client app. The API will be written in Node JS using the Express framework. Redis is used as the in-memory database to cache. The Express application will further communicate with the data base through Sequelize ORM.

A priority queue will be used to determine the relative importance of assignments and videos. While connected to the internet, the “highest priority” data will be downloaded. The database for the API will be a postgres SQL instance on Amazon’s RDS system.



*Figure 5: Major Functional Components Diagram*

### **Prototype Functional Description**

The Inclusive Classroom prototype will be accessible to users on a Windows 10, Mac, or Chromebook device. On the first login, the user will be authenticated while creating an account. Depending on the user type, the information and data presented will differ. For students a dashboard consisting of a UI displaying assignments and video lecture links will be presented. For teachers, the dashboard will consist of links to create assignments, grading, and starting video lectures. For administrators, the dashboard will consist of links to observe both teacher and

student progress. A weighted priority queue for downloading the most pertinent assignments will be algorithmically instated.

## External Interfaces

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

*Table 1: Prototype Features*

The initial prototype will communicate with both hardware and software components of Initial Classroom. The prototype interface will include three major categories: hardware interfaces, software interfaces, and user interfaces.

### **2.3.1 Hardware Interfaces**

Inclusive Classroom will differ between the client facing app and the API. The client facing app will run on Windows 10 PC, Mac, or Chromebook. The API will be run from the cloud. Specifically, Amazon Web Services will be used to host the API.

### **2.3.2 Software Interfaces**

Inclusive Classroom will consist of both a client application and a back end API. Each of these components will have specific software requirements. The client application will be a React Native web, Android, and iOS application to offer comprehensive coverage for student users. The client side application will store local data using SQLite. The API will use Node.js to execute JavaScript applications. In addition, IC's API will use Express.js on top of Node to handle HTTP requests.

### **2.3.3 User Interfaces**

Inclusive Classroom's client-side application will serve as an interface between the user and the API. Authentication of the user's account, will depend on the user's role.

### **2.3.4 Communications Protocols and Interfaces**

Inclusive Classroom's prototype will communicate with API using the REST format in accordance with RFC 2068.