

**University of Arkansas – CSCE Department**

**Capstone I – Preliminary Proposal – Fall 2019**

# **Student safety dismissal application**

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## **Abstract**

School dismissal is a stressful activity for both parents and teachers of young students. Our application aims to streamline this process by helping teachers to dismiss students to the correct mode of transportation and notifying parents when their child has been dismissed. With this project, we intend to have students leave school safely and efficiently. The efficiency of the proposed system helps ease instructors and parents in the dismissal process.

## **1.0 Problem**

School dismissal from elementary and middle schools is often a chaotic ordeal. Numerous safety issues need to be closely monitored by staff during this time. The teachers on duty are responsible for keeping the children away from moving vehicles while also ensuring that the car they are entering is the correct vehicle. Students riding the bus may not know the procedure or bus number they need to ride, and it's difficult for teachers to ensure student safety while also ensuring an orderly exit from the facility. Delays anywhere in the process frustrate parents and keep teachers at work longer than necessary.

While safety concerns are paramount at schools for young children, good safety protocols inevitably come at a cost to efficiency. By having an app that any teacher with a smartphone can use, we can reduce the burden of these protocols and improve the efficiency of the dismissal process. If the teacher has access to the correct mode of transportation and particular car or bus for each student at their fingertips, they can focus more on keeping children out of immediate danger and keep the lines moving. Teachers will have dynamic access to the location of each student and their current stage in the dismissal process without scanning printed roster sheets or relying on students often providing incorrect information on where they are going that particular day.

## **2.0 Objective**

The objective of this project is to provide teachers with a tool for a more efficient school dismissal, and parents with a notification system so they can respond quickly to any errors that may occur in the process. Car-lines will move more smoothly, in turn, reducing traffic and congestion around schools, children will miss their bus less often provided that they use the app correctly, and teachers will get home sooner having safely dismissed all students.

## **3.0 Background**

### **3.1 Key Concepts**

This application will need to be a full stack application to successfully meet the needs of the project. A full stack application consists of two main components: Client Side and Server Side. These two components of the application will be designed to communicate and transfer data between one another. Each component will serve a specific purpose to accomplish the overall goal, and each component will be briefly discussed below.

The client-side of the application will mainly be used by the user to read, update and delete any important data. For example, this data will be information relating to which students have left already and which type of transportation a student will take on a given day. The client-side will be a graphical user interface, meaning that the user will interact with the application by using graphical icons and buttons. The client-side will consist of both a mobile and a web component.

The server side will contain most of the business logic and will be responsible for storing and persisting the data used by the application. The server will consist of an API (Application Programming Interface) and a Database. The API will deal with requests made by the user from the client-side and make various changes in the database to reflect the request of the user. The API will be able to handle requests from multiple users. The database will be responsible for storing important data and ensuring that all the users have access to it.

## 3.2 Related Work

There are a few alternatives for school dismissal programs. *School Dismissal Manager*, *PikMyKid*, and *FetchKids*. All of these platforms are custom solutions that have a subscription and installation fees in the many thousands of dollars. We want to develop something cheaper the school could install themselves, by possibly having a website that an administrator could populate with student data rather than have an IT person migrate or build a database from scratch. By building an easy to use solution, teachers and administrators will have the ability to manipulate, manage and keep track of student data.

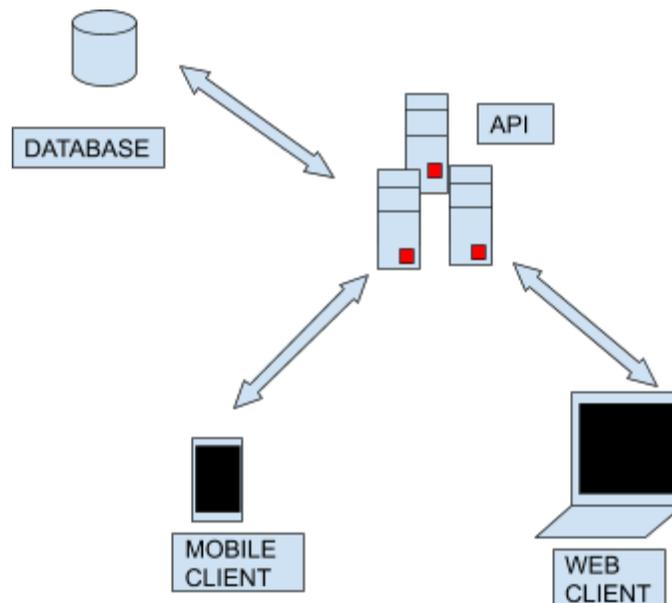
## 4.0 Design

### 4.1 Feature Requirements

1. *Administrators must be able to build and modify the core database with important data without any database query experience.*
2. *Teachers will have access to their students transportation data at anytime.*
3. *Teachers on duty will be able to fill the car-line queue by entering numbers displayed in parent vehicles.*
4. *A second on duty teacher will be given a continuously updating list of the students whose parents are waiting, in order, and be able to delete a student from the list when they safely enter their ride.*
5. *Website will allow parents to schedule what days and modes of dismissal their children will require.*
6. *Parent companion app/service to notify parents when the child is picked up.*
7. *Parent app will give notifications when a student is dismissed.*
8. *Allow parents to add their vehicles and their descriptions (eg. make, model, color). Give them an option to modify them.*
9. *Allow parents to add their names, address, phone, email, child names, guardian names(those who are allowed to pick up the student), emergency contacts.*
10. *Give a functionality to allow parents to notify teachers that their child will be picked up by another guardian/friend, whose car description is not yet saved in the database.*
11. *Allow parents to notify teachers how the student will get home. Choices would include: to be picked up, ride the bus, and others(when a parent allows a student to just walk home).*

## 4.2 High Level Architecture

### Image of Application Architecture



The data persistence will be handled with a NoSQL database like MongoDB. The database queries won't be very complex and each student will have a unique number which lends itself to the key-value structure of NoSQL. We will use a RESTful API created with the help of the Spring Boot framework to interact with the database from the client-side. The API will handle any requests from the client side. Some request will be, for example, simple database maintenance tasks like adding or modifying student data. The API will be able to handle requests from multiple clients and be robust enough to keep track of changes and provide reliable data efficiently.

There will be a web-based Single Page Web Application with a simple and intuitive user interface so administration can maintain their own database without constant technical support. The Single Page Application will be built using a modern web technology such as React.js. In addition, there will be an Android/iOS app to help teachers easily find the students as their parents arrive or direct them to the correct spot for dismissal. The Android/iOS application will be built using a cross platform technology such as React Native. There will also be an Android/iOS service of some type to notify parents in real-time when their student(s) are

dismissed and picked up. Each component of the overall application will be allowed to communicate with each other and transfer data in a secure and reliable way.

### 4.3 Risks

Risk	Risk Reduction
Parents looking at phone in line	The parent app has no use in the car-line. The parent app is for notifications only
Secure student data	SSL for transmissions and user roles and logins for different levels of functionality within the app

**4.4 Tasks** – Below we have created a task management window that we plan to follow and delve deeper into our project.

1. First we will do research on alternative applications, structures, and other tools that can help benefit our application in anyway shape or form. We will dive deeper into the best language, algorithms and design that allows for smoother workflow of the teachers and parents alike.
2. Decide the approach and technologies that will best suit the needs of the project.
3. Design and build the database schema and structure to handle the data and provide quicker responses, read ups, and manipulations.
4. Design and build robust back end system.with key functionalities.
5. Design and build the client applications to easily communicate with the back end system.
6. Once finished developing core components, improve the quality of the overall application and optimize any parts that can be implemented better.
7. Test extensively for security flaws, breaches, crashes, bugs, and other issues as much as possible.
8. Field test at some point using fake school area to see if full implementation was a success.
9. Write a report and presentation on the application and implementation of said project.

## 4.5 Schedule

Below is the proposed timeline which we have created corresponding the the tasks above. Each is estimated to be a two week period that has at least 1 person in charge of with everyone supporting or implementing key features of their own.

Tasks for two week period	Who Is In Charge	Dates for each task
1. Research	Everyone	Current date -1/1/20
2. Design and Build Database	Tomas, Khern	1/13/20 - 1/27/20
3. Design and Build API	David, Khern	1/27/20 - 1/31/20
4. Design and Build Client Side (Mobile)	David, Tory, Thierry	1/31/20 - 2/14/20
5. Building Client Side (Web)	Tory, Thierry	2/14/20 - 3/6/20
6. Unit Testing	Gabriel, Tomas	3/6/20 - 3/20/20
7. Integration Testing	David, Tory	3/6/20 - 3/27/20
8. Field test	Everyone	3/27/20 - 4/10/20
9. Presentation	Everyone	4/10/20 - Final

## Deliverables

1. Design Document: Contains a listing and brief description of each major component.
2. Website for teachers to modify and add to the student database, and parents to schedule how their children are to be dismissed each day.
3. Android/iOS application for teachers
4. Android/iOS service for notifications to parents

## 5.0 Key Personnel

**Tomas Stevens** – Stevens is a senior Computer science major in Computer Science and Computer Engineering Department at the University of Arkansas. He has completed database management along with software engineering to help benefit his team. He has worked as a student worker for the university dealing with large amounts of data within databases, websites and website protection, and security relating to such topics. Tasks he is responsible for are going to be the database management, and supporting role in the backend and security of the software, on both mobile and any other applications.

**Tory Adderley** - Tory is a senior studying Computer Science in the Computer Science and Computer Engineering Department at the University of Arkansas. He is a student with a passion for building applications and solving problems through use of technology. Tory has complete classes such as Artificial Intelligence, Software Engineering, Algorithms and Operating Systems. Along with a strong understanding of the fundamentals of computer science, Tory has built several web and mobile applications throughout his time as a student at the university. His internship experience with Engine eCommerce and with the university has also helped him to develop as a software engineer. He will be primarily responsible for building the client side applications on the web and mobile platforms.

**Gabriel Del Carmen** – Del Carmen is a senior Computer Science major at the Computer Science and Computer Engineering Department at the University of Arkansas. He has completed Software Engineering, Mobile Programming and Database Management courses. He has worked as a Research Assistant in the Computer Science and Computer Engineering Department. He is responsible for the client side. He will work on developing the mobile application.

**David Rowland** – Rowland is a senior Computer Science major in Computer Science and Computer Engineering Department at the University of Arkansas. He has taken Software Engineering, Algorithms, Mobile Programming, and Databases. During his internship with Cognizant he developed a web service application using Spring Boot, MongoDB, and Angular. He will help with the database and API development as well as the website.

**Ange-Thierry Ishimwe** – Ishimwe is a senior Computer Engineering major in Computer Science and Computer Engineering Department at the University of Arkansas. He has completed Algorithms, Software Engineering, and Database Management courses. Ishimwe worked as a research assistant for the Embedded Systems Laboratory, where he developed a

prototype for a mobile application that encrypts cryptocurrency and uses Bluetooth Low Energy for a wire transfer of cryptocurrency. He will help with the backend and the database.

**Khern Toussaint** – Toussaint is a Senior Computer Engineering major in the Computer Science and Computer Engineering Department at the University of Arkansas. He has completed Software Engineering, Algorithms and Programming paradigms. Toussaint worked as a research assistant for Dr Thompson on cryptography and also worked on personal projects involving databases and NodeJs. He will assist with the database and API development.

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