

Lab 1 - Care Corner Product Description

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1. Introduction

Sexual violence prevention is an issue women face on a regular basis. Nearly half of all women in the United States have been victims of sexual violence at some point during their lives (Smith et al, 2015). Of all sexual violence cases, 9 out of 10 are women (Tjaden, 1998). When walking alone women are vulnerable to predation, harassment, and stalking. Stalking often leads to sexual violence (Tjaden, 1998), and 16 million women have been stalked and fearful that they would be harmed (S. Smith et al, 2015). An annual survey conducted since 1973 has consistently held that women are twice as likely to feel unsafe walking at night alone as men (T. Smith et al, 2018).

Many women plan ahead to help themselves feel safer and want to be ready to take action should an attack occur. Six in ten women regularly take steps to avoid being sexually assaulted (YouGov, 2019). Some ways that women prepare to prevent sexual violence are: 73% report maintaining awareness of surroundings, 68% have a phone prepared, and 64% avoid certain areas (YouGov, 2019). Having a phone prepared and talking to someone while walking is a common defense technique (“Students feel safer”, 2008). These actions may help women feel safer but are disorganized, their efficacy is questionable, and do little to provide aid during an attack or support afterwards.

When an attack occurs the initial shock and emotional trauma can be overwhelming, as can the process of reporting it. Women are often confused about safely and effectively reporting sexual violence when it occurs (Schreyer, 2018). Women may feel that police will not take allegations of sexual assault seriously or may not know what information will be needed by authorities. A recording of the incident is the best proof that it occurred (Thurrott, 2019). Having a safety plan and a way to handle a potentially abusive situation is essential (Tjanden &

Thoennes, 1998). There is a lack of immediate, organized resources available to help prevent or deal with sexual attacks.

Care Corner is a mobile application that provides a toolkit to help deter sexual attacks, take action in the midst of sexual violence, and report a sexual violence incident. By incorporating a reliable and comprehensive feature set, Care Corner provides cohesive functionality for a reliable experience in handling sexual attacks. By helping to deter an attack, handle situations of an attack, and assist in processing an attack after it happens, Care Corner provides tools to help women handle sexual violence.

2. Care Corner Product Description

Care Corner is a mobile application with software features addressing different aspects of sexual violence. Functionality focuses on helping to deter sexual violence, deal with a sexual attack incident, and resources to report a sexual attack. The Care Corner mobile application has two main features to help deter sexual violence: enabling a user to make a fake phone call and providing contextualized safety tips before going on a walk. If a sexual assault occurs, a panic button is available to record and notify close contacts about the incident. A safe walk function monitors a predetermined walk plan and notifies contacts if the walk deviates because of a potential sexual assault. In the case that a sexual assault occurs, Care Corner assists in reporting the sexual violence incident and aids in recovery by providing resources. To aid in recovering from a sexual incident, journaling is offered to process the experience. By incorporating a reliable and comprehensive feature set, Care Corner provides cohesive functionality for a reliable experience in handling sexual attacks.

2.1 Capabilities and Key Features

The Care Corner capabilities focus on deterring a sexual attack, assisting during a sexual attack, and recovering from an attack once it has occurred. The two features that the Care Corner application provides to deter sexual violence are MomBot and Fake Phone Call. The two features to assist during a sexual attack are Panic Button and SafeWalk.

2.1.1 Detering Sexual Assault

The MomBot feature provides specific, contextualized advice to deter sexual assault. The MomBot feature analyzes speech to identify keywords, plan a walk as safely as possible, and provide specific contextual advice to help the user of Care Corner avoid a sexual attack. Using natural language processing and artificial intelligence, it determines the keywords needed to provide advice. When analyzed in context, nouns such as “alone” and “night,” verbs such as “walking,” and descriptive words such as “scared” or “sketchy” will provide key tips such as “when walking alone at night, you should have safe walk engaged.”

The Fake Phone Call feature simulates making a call so that a conversation can be carried out. This emulates a technique that women often use when walking. A simulated call will occur when activated, engaging an audible ring-tone that a user can answer and then carry on a conversation. Attackers would think the person on the other line is real, potentially preventing that attack from occurring. The Fake Phone Call is crucial if someone is in an area that has little cell phone service or they cannot find someone who is home at the time.

2.1.2 During a Sexual Assault

The Panic Button is a critical feature that can be triggered in the case of an attack. Once enabled, it will notify chosen contacts that there is a problem and begin to record the incident. The audio and video recording will be backed up off of the user’s phone so that it can later be

retrieved as evidence - even if the victim's phone is lost or stolen. The Panic Button works by sending a small amount of information to a remote system that then sends the message to chosen contacts to be notified efficiently and reliably.

Armed Walk will monitor the user's location and report to selected contacts if the route exceeds the preset time. By monitoring a user's position through a predefined plan, the safe walk feature can determine via GPS when the user has gone too far off the path. Relying on GPS and a downloaded route with coordinates ensures that the feature will work even if the user loses cell phone reception.

2.1.3 Post Sexual Assault

The Resource feature has items to help assist in the reporting, processing, and recovery after an incident of sexual attack. It provides hotlines and other resources for immediate assistance and information to aid in the proper reporting of an incident. The resource library is a curated list of vetted sources that will help the user feel confident that their report will be well received and effective. The Journal gives hints to help use it effectively and can aid an individual's recovery after an attack.

2.2 Major Components (Software/Hardware)

The functional components are grouped into two main parts: the Care Corner mobile application and the Care Corner API. The mobile application is the main interface for the user to interact with Care Corner through the Mobile GUI. The Care Corner API is a separate set of components that reside on a set of servers to provide functionality that need to be centralized in case a user loses their mobile phone.

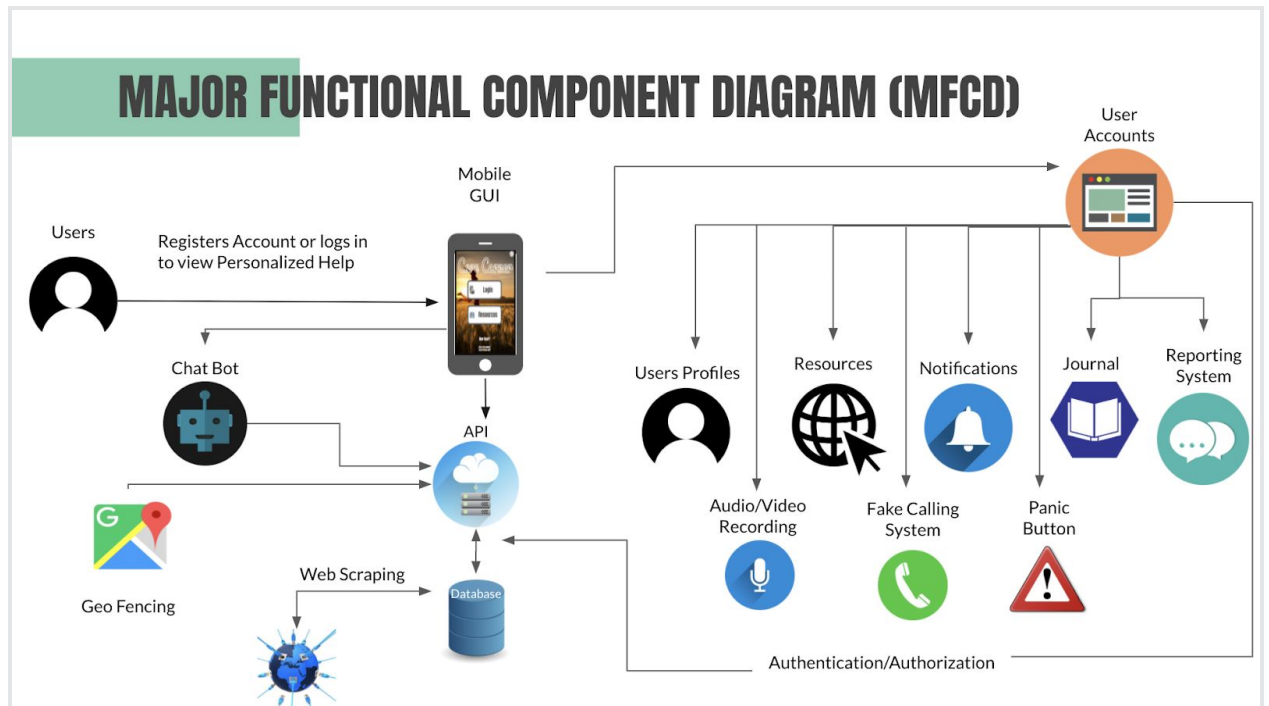
2.2.1 Software Components

The mobile client component is the primary interface through which the user interacts with the Care Corner application key features. This component is the Mobile GUI shown in Figure 1. This mobile interface exposes access to the main functional components to the user: User Accounts, User Profiles, Resources, Notifications, Journal, Fake Calling System, Panic Button, Audio/Video recording, and the Reporting System.

The Care Corner API is a group of components that provide backend services that the frontend of the Care Corner mobile application interfaces with. Some functional components are not isolated to the mobile component, like the Panic Button, and rely on the API to provide additional functionality. By splitting some components between the mobile application and a centralized API, there is resilience for data that should outlive a lost or stolen mobile phone.

Figure 1.

Major Functional Components



The User Accounts component handles authentication and authorization - providing access to a specific user's account and information. This component is exposed to the user of the application through a user login form on the mobile application. The mobile application connects to the Care Corner API, and the API centrally stores and verifies user accounts.

The User Profile component handles management of a user's profile information. Once the user has been authenticated, the profile information specific to that user can be managed. A user views their specific profile through the Mobile GUI component and can edit their profile information. The mobile application will then contact the Care Corner API to update their user information in a centralized location.

The Resources components provide a local store of text resources to help when reporting and researching a sexual attack. The user can search and view a list of sexual violence resources consisting of hotlines, help sites, and research. Lists of local counselors, shelters, and nonprofits are also provided. The Resources component checks for updates with the Care Corner API whenever a user views the information.

The Notification component handles the real-time messages that are sent to the user. These messages notify the user about informational updates and warnings. Informational updates consist of notices about software updates, resource updates, and important changes to Care Corner features. Warning notifications communicate to the user urgent messages, such as notices that they have deviated from their Safe Walk path.

The Journal component enables the documentation of a sexual attack through the entry, editing, and storing of journal entries. A user is able to create a journal entry that documents their experience and save it for later reference. The journal entries are backed up through the Care Corner API so they will not be lost if the user misplaces their mobile phone.

The Fake Calling System is the component that encompasses the Fake Call features. When a user selects to activate a Fake Call, they are able to select a time for the call to happen, the type of voice they would like to use, and whether it should trigger audio recording. Once the Fake Call time occurs, the user will receive a simulated call complete with a ring tone and the simulation of a person talking. The component functions exclusively on the local mobile phone so that it will work when the user does not have cell phone service.

The Panic Button component coordinates the features needed to fulfill the panic capability. The Panic Button component exposes a button to activate panic mode. Once activated, a minimal message is sent to the Care Corner API to handle the process of recording and notifying contacts. The functionality that resides within the mobile part of the Panic Button component is minimal to ensure a user's contacts are notified in the case the user loses their cell phone or it is turned off by an attacker. The button to activate the Panic Button is available on the main menu as well as during a simulated Fake Call.

The Audio and Video Recording component is responsible for any feature that needs to activate recording of audio or video. It provides a common component that the Fake Call and Panic Button component can use to start recording audio and video for later use as evidence. The audio and video initially resides on the user's mobile phone and is then backed up to a central location through the Care Corner API in case the user's phone is lost or stolen.

The Reporting System component aids in the reporting of an actual sexual attack. The component helps a user to report an incident by providing a set of preset questions that will give specific information needed by authorities to handle the sexual attack incident. The time and location of the report is stored for documentation.

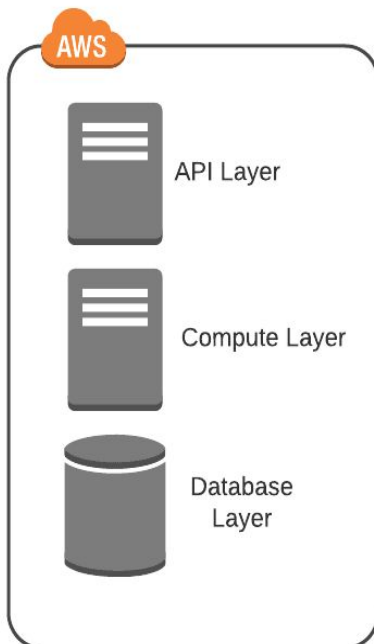
2.2.2 Hardware Components

For the Care Corner mobile client, a modern smartphone is needed. The phone should be no more than five years old with the latest software and security updates. To ensure effective service and performance, the smartphone should support 4G.

The hardware infrastructure for the Care Corner API is hosted at Amazon Web Services (AWS). The Care Corner API infrastructure's hardware components host the API layer, the compute layer, and the database layer. Figure 2 relays the primary high-level functional hardware support needed. By relying on modern serverless technology, the actual hardware provisioning and maintenance is simplified - being logical, not physical.

Figure 2.

Logical Hardware Components



3. Identification of a Case Study

Women attending Old Dominion University are the initial group identified to use Care Corner. They are part of the population that is both most afraid of an abusive attack and most likely to suffer an attack. College-age women are a good case study because they experience a high amount of abuse: astoundingly 26% of all undergraduate women experience some form of sexual violence (Fisher et al, 2000).

A group of volunteers will be obtained through advertising in the school newspaper, blogs, school flyers, and through social media. The group of volunteers will then be provided beta access to the application through sharing a link to the Google Play Beta testing program. Feedback and surveys will be collected weekly via email. The volunteers will be interviewed in person at the end of the beta program to obtain insights into their use of Care Corner.

While the initial user group that would find Care Corner useful is women, the application will be used by all genders and members of the LGBT+ community. The application could also be expanded beyond the initial focus on sexual assault in the future to handle other kinds of abuse such as domestic violence. The application would not require any functional changes to apply to these expanded groups of potential users.

4. Care Corner Product Prototype Description

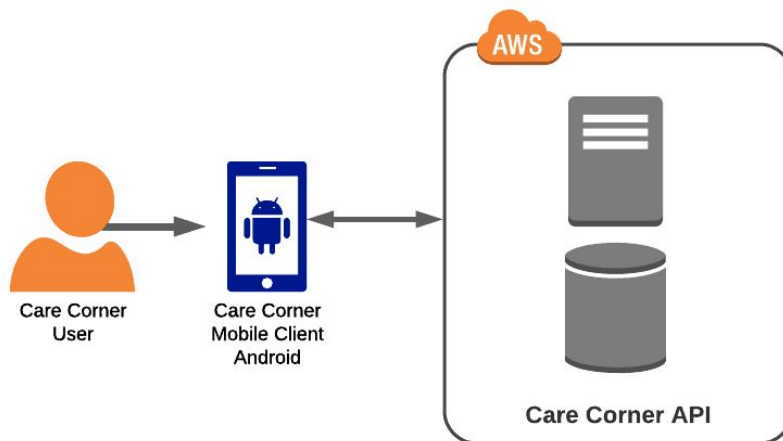
Goals of the Care Corner prototype are to demonstrate the main product features, evaluate parts of the product that are unique or risky, and to provide a technical foundation to build the final product from. The main set of features are trimmed to their minimal form in order to demonstrate and ensure there is a need for the product. Features of the application that do not provide core functionality are removed from the prototype so that user feedback can better inform and determine the most useful features for the next version.

4.1 Care Corner Prototype Architecture

The main architectural components of the Care Corner prototype are a mobile application and an application programmer interface (API). As illustrated in Figure 3, the user interacts with the Care Corner mobile client. The mobile client is primarily responsible for the user interface for Care Corner and for communicating with the Care Corner API. The Care Corner API is responsible for the centralized logic that is used by all users of Care Corner and persisting data, such as the audio and video recordings.

Figure 3.

Care Corner mobile client and API



4.1.1 Mobile Client

The mobile portion of the prototype will consist of an Android application using the Java programming language. The mobile application is limited to Android compatible phones so that the features can be vetted without worrying about cross-platform support. This will allow the prototype's focus to be on testing the functional value of features.

The mobile client is primarily responsible for the user interface of Care Corner. There are a

certain number of features whose logic can reside solely on the mobile phone. These features are ones that are important to function without cell phone or network connection. This reduces the risk that a user who loses cell phone reception would not be able to use the application. For example, Safe Walk is able to use GPS with a pre-planned route even if cell phone reception is lost.

4.1.2 Care Corner API

Many of the prototype features will work with the Care Corner API to complete the full feature. For example, the audio and video will be stored locally before being uploaded to the Care Corner API. If someone was under attack, the video would be available locally until it was uploaded.

The Care Corner API will use several AWS products to reduce risk, accelerate development, and improve the prototype's time of delivery. The API hardware needs shown in Figure 4 are "serverless" in that they are a paid service model versus physical services. The serverless model will simplify development and reduce the complexity that is associated with managing infrastructure. The serverless services also will scale as needed, reducing costs, and being prepared for future scaling needs.

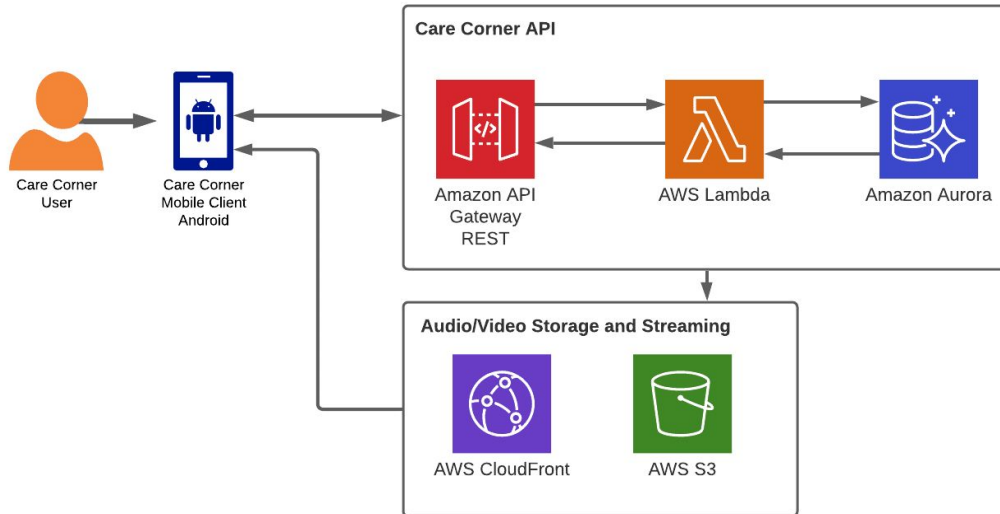
The AWS service API Gateway will be used to support the API public interface to the network. This AWS service will provide the routing and REST based protocol for the mobile client to interface with. The use of API Gateway will simplify the need to run a dedicated web server and allow routing a feature to a specific function.

AWS Lambda, will be the computing layer, complementing the API interface and taking the place of the traditional web server framework or application. AWS Lambda is a function-as-a-service product that AWS provides to simplify scaling application logic. Lambda reduces the complexity of managed infrastructure for a product like Care Corner, which is primarily a mobile application with a focused and minimal set of server side features.

The database is based on AWS Aurora, a service that eases database access and scaling. Unlike a lot of conventional databases, AWS Aurora allows traffic over HTTP so that AWS Lambda can access the database without worrying about the complexity of connection pooling. The service can scale up or down depending on database needs - solving the complex problem with sizing a database correctly to scale but does not cost too much. AWS Aurora is tuned to run efficiently - removing the need for a dedicated database administrator for the prototype.

AWS S3 is used for a flexible and simple media store for audio and video files. AWS S3 provides file storage that transparently scales. AWS S3 provides security by default - ensuring the publicly exposed endpoints will not be accidentally shared with the wrong audience. AWS Cloudfront is used as a content delivery network (CDN) to serve the media files efficiently. AWS Cloudfront works seamlessly with AWS S3 so that the media files do not need to be duplicated or moved to stream back to the user.

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Figure 4.*Care Corner API Architecture*

4.1.3 Local Development

A main challenge with relying on AWS services is the long feedback cycles to deploy the solution to a remote set of services. The provisioning and setup time can dramatically increase the time it takes to develop a solution. A local environment can be set up to mock the AWS services thereby reducing the risk and dependency of AWS.

Several open source projects are able to mimic an AWS environment locally. Localstack is a project that emulates the entire AWS stack enabling the API Gateway, Lambda, Aurora, and S3 to run locally. The Serverless Framework is developed by a company to simplify Lambda development. This enables local Android development without the AWS infrastructure to be deployed or ready. This not only decouples the development process but serves as a backup if all the AWS infrastructure is not put into place by the end of the development cycle.

4.1.4 Third Party Services

Twilio will be the main external service. The service will be used by the Panic Button component to send SMS notifications to contacts. When the Panic Button is triggered, the mobile application will send a message to the Care Corner API which will then use Twilio to contact individuals about the panic.

4.2 Prototype Features & Capabilities

The Care Corner prototype demonstrates the main functional elements of the solution. While the mobile application could easily capture and demonstrate the main features without the Care Corner API, a stated goal of the prototype is to prove architectural risks with using an API. The server side API provides needed resilience if someone’s mobile phone was lost or stolen.

Table 1

Care Corner RWP Features Verse Prototype Features

	RWP	Prototype
Safe Walk (armed) mode		
Notify contacts via MMS	Fully Functional	Fully Functional
Customize MMS messaging	Fully Functional	Eliminated
Send location/destination to contacts	Fully Functional	Fully Functional
Audio Recording &	Fully Functional	Fully Functional

Storage on Server	Functional	
Video Recording & Storage on Server	Fully Functional	
GPS data Recording & Storage on Server	Fully Functional	
If Location/Destination is sent	Functional	Eliminated
Panic Button		
Send location	Fully Functional	
Send preset message	Fully Functional	
Start recording audio	Fully Functional	
Start recording video	Fully Functional	
Dial out to pre-set contacts	Functional	Eliminated
Timestamp location and time of panic	Fully Functional	
Fake Phone call		
Start recording audio	Fully Functional	
Start recording video	Fully Functional	

	Functional	
Activate Panic	Fully Functional	Fully Functional
User can say key phrase to activate panic button	Fully Functional	Eliminated
Include fake voice	Fully Functional	Fully Functional
Pre-program what name the call appears to come from	Fully Functional	Fully Functional
Mombot		
Write plans and receive advice in response	Fully Functional	Partially Functional
Verbalize plans and receive verbalized advice in response	Fully Functional	Partially Functional
Journal		
Can record in/ view Journal	Fully Functional	Partially Functional
Journal will be encrypted	Fully Functional	Eliminated
Password Protected	Fully Functional	Fully Functional
Educational Readings		

Govt/Official documents (just main sites like RAINN)	Fully Functional	Partially Functional
Trusted blogs	Fully Functional	Partially Functional
National hotlines	Fully Functional	Partially Functional
Geofenced Resources		
Shelters	Fully Functional	Partially Functional
Non-Profits	Fully Functional	Partially Functional
Counselors	Fully Functional	Partially Functional
Campus Police	Fully Functional	Partially Functional
Websites		
Govt Official Sites	Fully Functional	Partially Functional
Trusted non-profits/ other	Fully Functional	Partially Functional
Depression/PTSD Counselor		
Reach a counselor via MMS	Fully Functional	Eliminated

Reporting Assistance (Partial)		
Time/location stamp at any time	Fully Functional	Fully Functional
Assistance reporting via preset questions	Fully Functional	Partially Functional
General		
Cross-Platform Support	Fully Functional	Partially Functional
Authentication		
User account creation/ authentication	Fully Functional	Partially Functional
User Credential Authentication	Fully Functional	Fully Functional
Password Recovery	Fully Functional	Fully Functional
File Server		
Audio/Video/GPS data stored	Fully Functional	Fully Functional
Database		
User/Contacts	Fully Functional	Fully Functional
Incident/Audio/Video /Journey	Fully Functional	Fully Functional

School/Resources	Fully Functional	Fully Functional
Mombot Advice	Fully Functional	Fully Functional

Edge cases, such as situations where there are reduced or no cell phone signal, are not initially handled. The designs for such situations are to be flushed out but not directly implemented. Table 1 highlights the minimal features being implemented to vet that the application is valued by users.

4.3 Prototype Development Challenges

There are several challenges that the development of the prototype will face. The design and feature set of the prototype strives to address some of these challenges directly. There are knowledge gaps in the mobile client and API technology that could increase the timeline. Scope creep is also an area of concern. It is common to be overly optimistic about a timeline - introducing features that are not essential for the prototype.

Dependency on AWS is another potential challenge. There have been delays with obtaining AWS access that may affect the overall development plan. Developing with AWS generally can be a long development cycle because everything resides at Amazon. A serverless framework is recommended to simplify local AWS Lambda development. Network issues and dependencies could also slow down overall development. The use of automated tools and mock frameworks will help mitigate this challenge.

5. Glossary

Agile: Set of frameworks and practices where solutions evolve through collaboration between self-organizing cross-functional teams

Amazon Web Services (AWS): Cloud computing platform provided by Amazon

AWS AppGateway: a fully managed service that makes it easy for developers to create, publish, maintain, monitor, and secure APIs at any scale

AWS AppSync: A fully managed service that makes it easy to develop GraphQL APIs

AWS Cloudfront: a fast content delivery network (CDN) service that securely delivers data, videos, applications, and APIs to customers globally

AWS Lambda: a serverless compute service that lets you run code without provisioning or managing servers

AWS RDS: easy to set up, operate, and scale a relational database in the cloud

AWS S3: an object storage service that offers industry-leading scalability, data availability, security, and performance

Android: Mobile operating system primarily developed by Google

API: Application Programming Interface

CDN: Content delivery network

Client-server: Computer system where a central server provides data to a number of networked workstations

Cloud Based Database Server: Virtual infrastructure that performs application and information-processing storage

Data Retention: Storage of an organization's data for compliance or business reasons

Database: Structured data held in a computer

DBA: Database administrator

File Server: Controls access to separately stored files

Geofencing: Using GPS to create a virtual geographic boundary

GitHub: Web-based collaboration platform for software developers

GPS: Global positioning system

Gradle: Build automation tool for multi-language software development

GUI: Graphical user interface

HTML: Standard markup language for documents designed to be displayed in a web browser

iOS: Mobile operating system developed by Apple

JavaScript: Object-oriented computer programming language commonly used to create interactive effects within web browsers

Kotlin: Object-oriented programming language initially designed for Android and Java Virtual Machine (JVM)

Linux: Unix-like, open source operating system for computers, servers, mainframes, etc.

MySQL: A freely available open source relational database management system that uses structured query language (SQL)

Scrum: A process framework used to manage product development and other knowledge work

Stakeholder(direct): Those involved in the company's day-to-day activities

Stakeholder(indirect): Those more interested in the result of the production

Twilio: A developer platform for communications

UI / UX: User Interface / User Experience

Web Scraping: Extracting/scraping data from websites

Web Server: server software, or a system of one or more computers dedicated to running this software, that can satisfy client HTTP requests

Windows: Series of operating systems developed by Microsoft

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