

Crisis Relief

Team #5

Team Members:

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2. **Francis Aviles** - Database Administrator
3. **Ayesha Irum** - Backend Lead
4. **Geoart Corral** - GitHub Master / Co-Frontend Lead
5. **Karla Cardenas Andrade** - N/A
6. **Kyle Nguyen** - Technical Writer / Co-Frontend Lead

Milestone 4

Milestone	Version	Date
Milestone 4	Version 2	May 18, 2025
Milestone 4	Version 1	May 8, 2025
Milestone 3	Version 2	April 24, 2025
Milestone 3	Version 1	April 17, 2025
Milestone 2	Version 2	April 17, 2025
Milestone 2	Version 1	March 30, 2025
Milestone 1	Version 2	March 20, 2025
Milestone 1	Version 1	February 20, 2025

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Product Summary

Final P1 and P2 Functional Requirements:

1. Users

Priority 1 – Critical

- **1.1** The system shall allow users to register using an email and password.
- **1.2** The system shall allow users to securely log in to access protected features.
- **1.3** The system shall allow users to update their profile and notification preferences.
- **1.4** The system shall allow users to save favorite resource locations for quick access.
- **1.5** The system shall allow users to view detailed information about resources (e.g., address, hours).

Priority 2 – Important

- **1.6** The system shall allow users to submit reviews and ratings for resources.
- **1.7** The system shall allow users to report incorrect or outdated resource information.
- **1.8** The system shall allow users to view their search history.

2. Relief Workers

Priority 1 – Critical

- **2.1** The system shall allow relief workers to log in with elevated permissions.
- **2.2** The system shall allow relief workers to update emergency shelter capacity.
- **2.3** The system shall allow relief workers to update food bank inventory.
- **2.4** The system shall allow relief workers to update medical center availability.

Priority 2 – Important

- **2.5** The system shall allow relief workers to mark resource shortages (e.g., water, blankets).
- **2.6** The system shall allow relief workers to generate reports on resource usage and availability.

3. Emergency Resources

Priority 1 – Critical

- **3.1** The system shall allow users to search for nearby shelters, food banks, and medical centers.
- **3.2** The system shall display real-time availability of shelters, food banks, and medical centers.
- **3.3** The system shall show estimated travel times to emergency resources.
- **3.4** The system shall display high-risk areas and suggest alternative safe zones.
- **3.5** The system shall allow resource updates by relief workers or system administrators.

Priority 2 – Important

- **3.6** The system shall allow users to filter search results by type, availability, and distance.
- **3.7** The system shall provide multilingual support for viewing emergency resources.

4. Weather Alerts

Priority 1 – Critical

- **4.1** The system shall notify users of active weather alerts affecting resource access.
- **4.2** The system shall display current and forecasted weather for selected regions.

Priority 2 – Important

- **4.3** The system shall allow users to set custom alerts for specific weather conditions.
- **4.4** The system shall allow administrators to manage and configure weather alert regions.

5. Notifications and Alerts

Priority 1 – Critical

- **5.1** The system shall send real-time notifications for changes in shelter capacity if the user has saved the location.
- **5.2** The system shall send alerts for food bank restocking and availability.
- **5.3** The system shall send critical alerts for medical availability and weather threats.

Priority 2 – Important

- **5.4** The system shall allow users to customize which notifications they receive
- **5.5** The system shall notify relief workers when users interact with their updates.

6. Feedback

Priority 2 – Important

- **6.1** The system shall allow users to submit feedback with ratings and comments for each resource.
- **6.2** The system shall allow admins to review and moderate submitted feedback.

7. Search and Personal Data

Priority 2 – Important

- **7.1** The system shall track and display a user's previous searches.
- **7.2** The system shall allow users to view historical data for each resource.

Unique Features

CrisisRelief stands out from competitors (like 211.org or FEMA resource lists) in the following ways:

- **Search Bar with Filter:** You can use a search bar which can filter searches by ZIP code, or by specific resources.
- **Integrated Weather Alerts (via Weather API):** Users receive real-time weather updates that help inform their decisions during crises.
- **Integrated Feedback Loop:** Users can leave comments/reviews on resources to improve reliability and track real-world conditions (e.g., “This location was closed at 4PM”).
- **Google Maps Pin Filtering:** Visual display of resources allows spatial reasoning and fast decision-making in emergencies.
- **Role-Based Interaction:** Tailored interface and permissions improve safety and reliability of information entered by users.

Deployment URL

- You can access the deployed CrisisRelief platform at: <http://crisisrelief.duckdns.org:5173/>

Usability Test Plan

Test Objective:

- Search for emergency resources
- Leave feedback about a resource
- View resource details and map location
- Filter resource by type
- Submit a new resource

Test Objective:

The objective of our usability test is to evaluate how easily and effectively user can navigate through our website's core features under realistic conditions. While assessing the users, we will be focusing on effectiveness (were the users able to complete their task), efficiency (how long did it take for the users to complete their task) and user satisfaction (did the user feel confident and in control while doing the task). We are doing this to ensure that not only does our website function correctly, but when users are in a high-stress crisis related scenario, the user will be able to find the resources they need quickly and efficiently, which is critical in times like these.

Test Description:

System Setup:

The system setup is intentionally minimal to reflect real-world user conditions. Each test participant is equipped with a standard laptop (Windows/macOS) that has internet access and the Google Chrome browser installed (latest version).

Starting Point:

All tests begin at the main CrisisRelief platform homepage: <http://crisisrelief.duckdns.org:5173/> From this entry point, users interact with key features such as searching for emergency resources, filtering facilities by type, viewing Google Maps, submitting new resources (if authorized), and leaving feedback.

Effectiveness and Efficiency Table:

Use Case	% Completed	Errors	Comments	Efficiency
Search for emergency resources	80%	Doesn't redirect to the proper specific page for some categories	Results are good, but the page wasn't specific for some	17s / 21s = 80.95%
Leave feedback about a resource	100%	None	Comfortable and interactive writing space, can view older reviews	62s / 62s = 100%
View resource details and map location	95%	The description field was typically unavailable	Big and clear selection of info, but would display "Description Unavailable" constantly	34s / 34s = 100%
Filter resource by type	50%	Can't search in each specific category	Can search generally and view specific resource pages, but searching while in some does not keep you in the correct page	35s / 102s = 34.31 %
Submit a new resource	20%	Only present on the weather page	Expected something similar to the weather page to be available on all resource pages	27s / 94s = 28.72%

User Satisfaction

Search for emergency resources

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I felt like there were too many fields for a search.				x	
I felt like the search was fast and quick.		x			
I thought that searching was easy to use.		x			

Leave feedback about a resource

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I thought that leaving a review was easy.				x	
I wish leaving a review had more features.		x			
I felt like other people's reviews had enough information.				x	

View resource details and map location

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I felt like the details shown were enough for my search.		x			
I thought that only relevant information was shown.		x			
I felt like the display of information was clear.					x

Filter resource by type

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I thought there was a type of resource that was missing.				x	
I felt like there were too many types of resources.		x			
I felt like the names of the types were descriptive enough for me to understand them.				x	

Submit a new resource

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I thought that submitting a new resource was intuitive.	x				
I felt like I would enjoy using this system.			x		
I felt like all the steps were necessary and relevant.				x	

QA Test Plan

1. Usability

Test Objective: Verify that users with minimal technology proficiency can complete basic task like finding resources and viewing details

HW and SW Setup: The user will be using a laptop provided to them by me with access to Google Chrome. URL: <http://crisisrelief.duckdns.org:5173/>

Features to be Tested: Navigating through the page easily and being able to find resources

Test #	Title	Task Description	Input	Expected Output	Result
1	Locate shelter	User searches for “emergency shelter”	“Emergency shelter”	List of nearby shelters appear	FAIL
2	View resource details	Click on shelter to view more info	Shelter Card	Open shelter page with addresses, hours, maps, etc.	PASS
3	Navigation flow	Use back/home button and switch tabs	Back/Home clicks	Returns to search or homepage correctly	PASS

2. System Requirement

Test Objective: Users shall be able to complete their task through their smartphone, laptop, or desktop

HW and SW Setup: The user will be using a laptop and an Iphone provided to them by me with access to Google Chrome. URL: <http://crisisrelief.duckdns.org:5173/>

Features to be Tested: Cross-device task functionality

Test #	Title	Task Description	Input	Expected Output	Result
1	Mobile report task	Access dropdown marker in Overnight Shelters	Select Facilities	Dropdown for Facilities is shown	PASS
2	Desktop view shelters	Submit Review on shelters	Enter review and give stars	Review submitted successfully and shown	PASS
3	Laptop language switch	Switch the language on home page	Choose Vietnamese	Home page language switches	PASS

3. Storage

Test Objective: Verify that all relevant user and resource data is correctly written to and retrievable from a MySQL relational database.

HW and SW Setup: The user will be using a laptop provided to them by me with access to Google Chrome. URL: <http://crisisrelief.duckdns.org:5173/>

Features to be Tested: Data persistence of users and resource updates.

Test #	Title	Task Description	Input	Expected Output	Results
1	Store user registration	Register a new user and check DB	Name, email, password	New user row exists in MySQL users table	PASS
2	Store resource update	Submit status change for a location	Resource ID, new status	Change is reflected in resources table	FAIL
3	Data retrieval validation	Retrieve data via API and DB manually	GET /resources endpoint	API matches MySQL data exactly	PASS

4. Privacy

Test Objective: The only data that CrisisRelief shall collect is name, help needed, and location.

HW and SW Setup: The user will be using a laptop provided to them by me with access to Google Chrome. URL: <http://crisisrelief.duckdns.org:5173/>

Features to be Tested: Ensure no unnecessary data is collected or sent in API requests.

Test #	Title	Task Description	Input	Expected Output	Result
1	Inspect request	Submit user form, review payload	Signup Form	Only name,username, email, and password sent to backend	PASS
2	Check API logging	Review server logs after login	Logged-in user	Only relevant fields are stored	PASS
3	Session token test	Confirm x hours session expiration	Login	Session invalid after 2 hours	PASS

5. Content

Test Objective: The directions to locations shall be easily readable.

HW and SW Setup: The user will be using a laptop provided to them by me with access to Google Chrome. URL: <http://crisisrelief.duckdns.org:5173/>

Features to be Tested: Ensure that emergency resource information is presented clearly and is readable across devices.

Test #	Title	Task Description	Input	Expected Output	Result
1	Click marker for shelter	Click marker for a shelter	Map interaction	Info panel opens with readable text	PASS
2	Text clarity on resources	Check font size, spacing, and layout of text	Open a resource listing	Content is clearly readable, no crowding	PASS
3	Font & size check	Visually inspect content formatting on mobile	Shelter info on phone	Text scales properly, remains legible	PASS

Localization Testing

Localization Plan: For localization, our plan for testing involves supporting both English and Vietnamese within the home page of the web page. We use a state-based language switcher implemented via useState in React, along with a centralized translations object for managing language-specific text.

Test #	Description	Input	Expected Output	Result
1	Switch language to Vietnamese using dropdown	Select vi from menu	All header texts appear in Vietnamese	PASS
2	Verify the main CTA button updates when language changes	Select vi	Button text changes to Vietnamese equivalent	PASS
3	Ensure all resource card labels update	Toggle to vi	Card titles show correct Vietnamese terms	PASS
4	Check layout responsiveness	Resize window, switch lang	Layout remains clean and unbroken	PASS

Results: All tested components successfully displayed translated content based on the selected language, with one exception: the Navbar did not translate as expected. This was the only component that remained in English regardless of the selected language setting.

Chúng tôi ở đây để giúp bạn có một ngày mai tốt đẹp hơn

Crisis Helper là dự án do sinh viên lãnh đạo nhằm hỗ trợ cộng đồng thu nhập thấp ở San Francisco. Trang web này giúp giảm số gia đình gặp khó khăn trong việc nhận được những nhu cầu thiết yếu hàng ngày.

Tìm Dịch Vụ Hỗ Trợ Địa Phương



Trợ Giúp Y Tế



Nơi Qua Đêm



Ngân Hàng Thực Phẩm



Cảnh Báo Thời Tiết

Trợ Giúp Một Nơi

Tìm tất cả nguồn lực nhanh chóng!

- Cần trợ giúp y tế?
- Cần nơi qua đêm?
- Cần thực phẩm?
- Muốn biết cảnh báo thời tiết?
- Cần sự giúp đỡ khác?

Nhấn vào, và bạn sẽ có tất cả!

Bạn đang tìm kiếm hỗ trợ gì?



Hỗ Trợ Y Tế
Tim dịch vụ chăm sóc
theo nhu cầu của bạn



Nơi Trú Ẩm Qua Đêm
Tim nơi trú ẩn



Ngân Hàng Thực Phẩm
Nhận thực phẩm bạn
cần



Cảnh Báo Thời Tiết
Chuẩn bị cho thời tiết
bên ngoài



Tìm Kiếm Chung
Không có nhu cầu cụ
thể?

Ngôn ngữ: Tiếng Việt

Nơi Trú Ẩm Qua Đêm

Family Supportive Housing
692 N King Rd, San Jose, CA 95133
Điện thoại: +1 408-926-8885
Mô tả: Không có mô tả
Trang web: <http://www.familysupportivehousing.org/>

Giờ Mở Cửa

- Thứ Hai: Mở cửa cả ngày
- Thứ Ba: Mở cửa cả ngày
- Thứ Tư: Mở cửa cả ngày
- Thứ Năm: Mở cửa cả ngày
- Thứ Sáu: Mở cửa cả ngày
- Thứ Bảy: Mở cửa cả ngày
- Chủ Nhật: Mở cửa cả ngày

Đánh Giá

Bình giá của bạn:

Rating: ★ ★ ★ ★ ★

Gửi Bình Giá

Danh Giá

Chưa có đánh giá nào. Hãy là người đầu tiên để lại đánh giá!



Code Review

Coding Standards:

- Teams Best Coding Practices
 - Use Prettier to ensure consistent formatting throughout the code
 - Have most of our code written with TypeScript that also has functional React components
 - Have a consistent folder structure that follows feature based organization
 - Have reusable UI for certain pages using Tailwind CSS.

GitHub Code Review:

Food banks now take in zipcode [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
AviGeck committed 1 hour ago

Zipcode works now [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
AviGeck committed 2 hours ago

ZIP Code change [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
Francis needs the change right now so I'm pushing this one file while working on my other stuff
SourMayo committed 2 hours ago

Added Vietnamese translation for the home page [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
KyleNguyen00 committed 6 hours ago

Finished frontend for misc search [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
if you have merge conflicts, it should be okay to accept both incoming changes as it shouldn't break anything. All the temporary testing stuff is commented out and everything else is a normal addition.
SourMayo committed 12 hours ago

Commits on May 6, 2025

Reviews are now properly stored in database [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
based of location and type of resource
KyleNguyen00 committed yesterday

Merge branch 'development' of https://github.com/stsu-joseo/csc648-848-05-sp25-T05 into development [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
SourMayo committed yesterday

Adjust the search bar to include ZIP code [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
I'm still working on the misc page but I'm pushing this one file in case Francis needs it right now. You can access the inputted ZIP code via zipquery'
SourMayo committed yesterday

Leftover frontend changes plus adjustments [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
Some small changes on top of the ones requested were done for the sake of consistency.
SourMayo committed 2 weeks ago

Added map API for food banks, medical resources, and overnight shelters [diff](#) [blob](#) [raw](#) [tree](#) [copy](#) [link](#)
and overnight shelters
Just used mapview.tsx to test and added a route to the mapview component in the app.tsx file. Will remove the route in the next commit.
KyleNguyen00 committed last week

Kyle Nguyen 5/5/2025 3:20 PM
Also was anyone getting errors here

```
64      )
65      window.onload = findShelters;
66      document.addEventListener("load", findShelters);
67      var facilities = [
68        {
69          id: 1,
70          name: "Yates Haven Shelter",
71          address: "124 Castro Street",
72          phone: "(415) 416-5612",
73          website: "https://www.yateshavenshelter.org",
74          lat: 37.7749,
75          long: -122.4594,
76          description: "Yates Haven Shelter provides 24/7 support, offering a safe, welcoming environment with meals, emergency beds, and access to essential resources for individuals experiencing homelessness.",
77          quickInfo: [
78            {
79              message: "(415) 416-5612", // Notify Vite, I meant to add this instead of drag down
80              bedsAvailable: 10,
81              languageSupport: "English, Spanish",
82              walking: 10
83            }
84          ],
85        },
86        {
87          id: 2,
88          name: "Tarias Outreach",
89          address: "162 Church Ave"
90        }
91      ]
92    
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULTS (PREVIEW)

- ↳ overnightshelter.ts(1,10) [node_modules/]
- ↳ Uncaught var, use let or const instead, eslint@typescript-eslint/no-var-requires [line 68, col 10]
- ↳ Uncaught var, use let or const instead, eslint@typescript-eslint/no-var-requires [line 68, col 10]
- ↳ optional chain expressions can return undefined by design - using a non-null assertion is unsafe and wrong, eslint@typescript-eslint/no-non-null-asserted-optio... [line 48, col 10]
- ↳ optional chain expressions can return undefined by design - using a non-null assertion is unsafe and wrong, eslint@typescript-eslint/no-non-null-asserted-optio... [line 58, col 10]
- ↳ Uncaught var, use let or const instead, eslint@typescript-eslint/no-var-requires [line 68, col 10]

```

Geoart Corral Yesterday at 11:14 PM
add const [lat] etc
then set it on line 45

then change the lat and longitude
// ...
const request = {
  textQuery: `inputtedSearch`,
  fields: [
    "id",
    "editorialSummary",
    "firstReviewed",
    "allowSlog",
    "businessStatus",
    "displayPhone",
    "internationalPhoneNumber",
    "location",
    "photos",
    "primary",
    "primaryDisplayname",
    "rating",
    "region",
    "website",
    "userRatingCount",
  ],
  language: "en-US",
  maxResultCount: 10,
  locationBias: { lat: 37.416149, long: -122.001216 },
  region: "US"
};

// ...

```

➡️ Search is working

➡️ Connection done

[CrisisRelief Simple Search Intro](#)

External Code Review:

For our external code review, our group had messaged Tunshin Kulshreshtha and given him our \backend\src\routes\search.ts and our \frontend\pages\Register.tsx and here was the response given to us.

Code Review

The code is well-written and follows best coding practices, such as avoiding single-file dependency. This helps maintain overall functionality while distributing tasks across multiple files, making the code more readable and easier to understand. The lines of code are concise and appropriately structured, contributing to a clean and organized codebase. The backend is also well-implemented, demonstrating a clear understanding of operations—whether it's connecting to a database or making external API calls to fetch data. Overall, the code is of high quality, with a well-defined structure that clearly conveys how the application works.

– Tushin Kulshreshtha

Self-Check on Security Practices

Major Assets:

- User credentials (emails, passwords)
- Sensitive user data (reviews, feedback)
- Database records (locations, resources, users)
- Server infrastructure (EC2 instance)
- API keys and access tokens
- Backend is protected with **CORS**, restricting requests to known areas.
- .env files hide our database urls and API keys
- EC2 and database access is locked down and not accessible to unauthorized users.
- Database has migrations so we can recreate it

Password Encryption:

User passwords are encrypted before being stored in the database using a secure hashing algorithm (e.g., bcrypt). This ensures that even if the database is compromised, raw passwords cannot be accessed.

	user_id	first_name	middle_name	last_name	username	email	hashed_password
1	1	Ansa	hj	vats	asadc@sfsu.edu	asadc@sfsu.edu	\$2b\$10\$PgZBXSKLsqxGmKgEofLKw.KrA0gQMVKXbLX79h3QR.Eyr0l0Med1K

Input Validation:

When a user submits a search query, we first check if the input is present and trimmed

```
if (!query?.trim()) {  
    return res.status(400).json({ error: "Search query is required." });  
}
```

This ensures the input is not empty or made up of just whitespace. Then, before running the query, we safely pass the string into a parameterized query using PostgreSQL's plainto_tsquery:

```
.whereRaw(  
    `to_tsvector('english',  
    coalesce(locations.name, '') || ' ' ||  
    coalesce(locations.description, '') || ' ' ||  
    coalesce(inventory.name, '') || ' ' ||  
    coalesce(items_needed.name, '')  
) @@ plainto_tsquery('english', ?),  
    [`${userInput.toLowerCase()}:*`]
```

Since we are using a parameter binding, it prevents SQL injection, because user input is never directly added to the SQL string. We also normalize the input with `.toLowerCase()` to improve search consistency

Self-Check: Adherence to Non-Functional Specs

Usability:

- The system shall have a simple and intuitive interface so users can quickly find emergency resources without confusion. - **DONE**
- Users shall be able to easily navigate through the system, even with limited tech skills - **DONE**
- Registered Users with no formal training shall be able to change the status of locations. - **ON TRACK**
- Registered Users with no formal training shall be able to mark shortages. - **ON TRACK**
- Users within poor environments, like tents, shall be able to complete their tasks. - **DONE**

System requirements:

- Users shall be able to complete their tasks through their smartphone, laptop, or desktop. - **DONE**
- CrisisRelief shall use Google Maps API to suggest locations of food banks, or emergency shelters. - **DONE**
- CrisisRelief shall use OpenWeatherMap API to gather information about the weather. - **DONE**

Performance requirements:

- Users shall be able to access the status of locations within 5 minutes. - **ON TRACK**
- Registered Users shall be able to change the status of locations within 5 minutes. - **ON TRACK**
- Weather information from CrisisRelief shall be in real time. - **DONE**
- Food bank information from CrisisRelief shall be in real time. - **ON TRACK**

Storage

- CrisisRelief shall store data with MySQL. - **DONE**
- CrisisRelief servers shall be hosted with Amazon EC2. - **DONE**
- The database shall be relational. - **DONE**
- Datagrips shall be used to update the database. - **DONE**

Privacy

- The data of the user shall not be sold. - **DONE**
- The only data that CrisisRelief shall collect from the user is their name, what help they need, and where they are located. - **ON TRACK**
- When a user logs in, they shall receive a session token that lasts for 2 hours. - **TRACK**

Content

- The information given shall be easily read through text. - **DONE**
- Images of nearby locations shall be shown to the user if available. - **DONE**
- The directions to locations shall be easily readable. - **DONE**

Marketing

- CrisisRelief shall easily be found by people looking for CrisisRelief. - **DONE**
- CrisisRelief shall use SEO to make it easier to find on search engines like Google. - **ON TRACK**
- CrisisRelief shall have social media pages to help visibility. - **ON TRACK**

Issues:

Many of our issues stem from us not having roles ready, so that impacts our ability to be able to provide updates and give notifications to users. Because of this some if not most of our P1 and P2 priorities were not met, but are definitely going to be finished by the final milestone.

List of Team Contributions: (Team Lead)

Kyle Nguyen (Documentation Lead / Frontend) – 9/10

- Continued leading documentation with quality and consistency.
- Worked on implementing the basic Google API integration.
- Worked on the code review.

Karla Cardenas Andrade (Frontend) – 0/10

- Did not contribute to any new code, design, or communication.
- No commits or collaboration during this phase.
- Submitted code previously that caused issues and required fixing.

Geoart Corral (GitHub Master / Frontend Lead) – 8/10

- Assisted with website deployment and testing.
- Contributed to the Profile page and Search feature.
- Provided backend support during final integration stages.
- Strong involvement, though with slightly reduced leadership role this phase.

Ayesha Irum (Backend / Accessibility) – 8.5/10

- Successfully implemented and fixed the OpenWeatherAPI integration.
- Took ownership of accessibility features and ensured compliance.
- Good technical contribution but with minor setbacks in meeting full backend expectations.

Francis Aviles (Database Lead) – 7.5/10

- Worked on improving database functionality and contributed to Google API search integration.
- Still had trouble delivering fully functional backend components.
- Contributed consistently but performance remained below expectations for a lead role.

Milestone 3 Version 2

Data Definitions

- **Users**

- The user entity represents individuals interacting with the platform. There are three distinct roles: general users, relief workers, and admins.
- General users can browse available resources, read updates, and choose to sign up for more features.
- Relief workers are registered individuals who can contribute updates and submit resource availability changes.
- Admins manage the system, approving updates and overseeing submissions.
- The registration process stores account credentials like email and password, which only apply to registered users (relief workers and admins).

- **Emergency Resources**

- This entity covers all physical assistance points such as food banks, medical centers, shelters, and support stations. Each resource contains high-level info like name, type, address, and accessibility features. Their purpose is to provide real-time availability and operational status for users searching for aid.

- **Weather Alerts**

- Weather alerts notify users of urgent climate conditions like storms, floods, or heatwaves. These alerts are region-specific and include severity levels and descriptions. The entity ensures users can prepare for emergencies based on timely and region-specific warnings.

- **Notifications and Alerts**

- These messages are sent to users to inform them of critical updates, such as system notices, resource status changes, or new weather alerts. This helps users stay informed and take immediate action if necessary.

- **Feedback**

- Feedback allows users to review resources they've interacted with. Each entry ties a user to a resource and includes a rating and optional comments. It provides quality control and insights for improving the platform.

- **Search and Personal Data**

- This tracks users' interactions with the search function. It records search terms, results returned, and selected entries. The purpose is to personalize future searches and help improve system performance and relevance.

Prioritized High Level Functional Requirements

1. Users

Priority 1 – Critical

- **1.1** The system shall allow users to register using an email and password.
- **1.2** The system shall allow users to securely log in to access protected features.
- **1.3** The system shall allow users to update their profile and notification preferences.
- **1.4** The system shall allow users to save favorite resource locations for quick access.
- **1.5** The system shall allow users to view detailed information about resources (e.g., address, hours).

Priority 2 – Important

- **1.6** The system shall allow users to submit reviews and ratings for resources.
- **1.7** The system shall allow users to report incorrect or outdated resource information.
- **1.8** The system shall allow users to view their search history.

Priority 3 – Nice-to-Have

- **1.9** The system shall allow users to share resource information via social media or email.
 - **1.10** The system shall allow users to access data in offline mode for saved resources.
-

2. Relief Workers

Priority 1 – Critical

- **2.1** The system shall allow relief workers to log in with elevated permissions.
- **2.2** The system shall allow relief workers to update emergency shelter capacity.
- **2.3** The system shall allow relief workers to update food bank inventory.
- **2.4** The system shall allow relief workers to update medical center availability.

Priority 2 – Important

- **2.5** The system shall allow relief workers to mark resource shortages (e.g., water, blankets).
- **2.6** The system shall allow relief workers to generate reports on resource usage and availability.

Priority 3 – Nice-to-Have

- **2.7** The system shall allow relief workers to communicate internally through a chat system
-

3. Emergency Resources

Priority 1 – Critical

- **3.1** The system shall allow users to search for nearby shelters, food banks, and medical centers.
- **3.2** The system shall display real-time availability of shelters, food banks, and medical centers.
- **3.3** The system shall show estimated travel times to emergency resources.
- **3.4** The system shall display high-risk areas and suggest alternative safe zones.
- **3.5** The system shall allow resource updates by relief workers or system administrators.

Priority 2 – Important

- **3.6** The system shall allow users to filter search results by type, availability, and distance.
- **3.7** The system shall provide multilingual support for viewing emergency resources.

Priority 3 – Nice-to-Have

- **3.8** The system shall allow administrators to bulk import emergency resources via file upload or dashboard.

4. Weather Alerts

Priority 1 – Critical

- **4.1** The system shall notify users of active weather alerts affecting resource access.
- **4.2** The system shall display current and forecasted weather for selected regions.

Priority 2 – Important

- **4.3** The system shall allow users to set custom alerts for specific weather conditions.
 - **4.4** The system shall allow administrators to manage and configure weather alert regions.
-

5. Notifications and Alerts

Priority 1 – Critical

- **5.1** The system shall send real-time notifications for changes in shelter capacity if the user has saved the location.
- **5.2** The system shall send alerts for food bank restocking and availability.
- **5.3** The system shall send critical alerts for medical availability and weather threats.

Priority 2 – Important

- **5.4** The system shall allow users to customize which notifications they receive
 - **5.5** The system shall notify relief workers when users interact with their updates.
-

6. Feedback

Priority 2 – Important

- **6.1** The system shall allow users to submit feedback with ratings and comments for each resource.
 - **6.2** The system shall allow admins to review and moderate submitted feedback.
-

7. Search and Personal Data

Priority 2 – Important

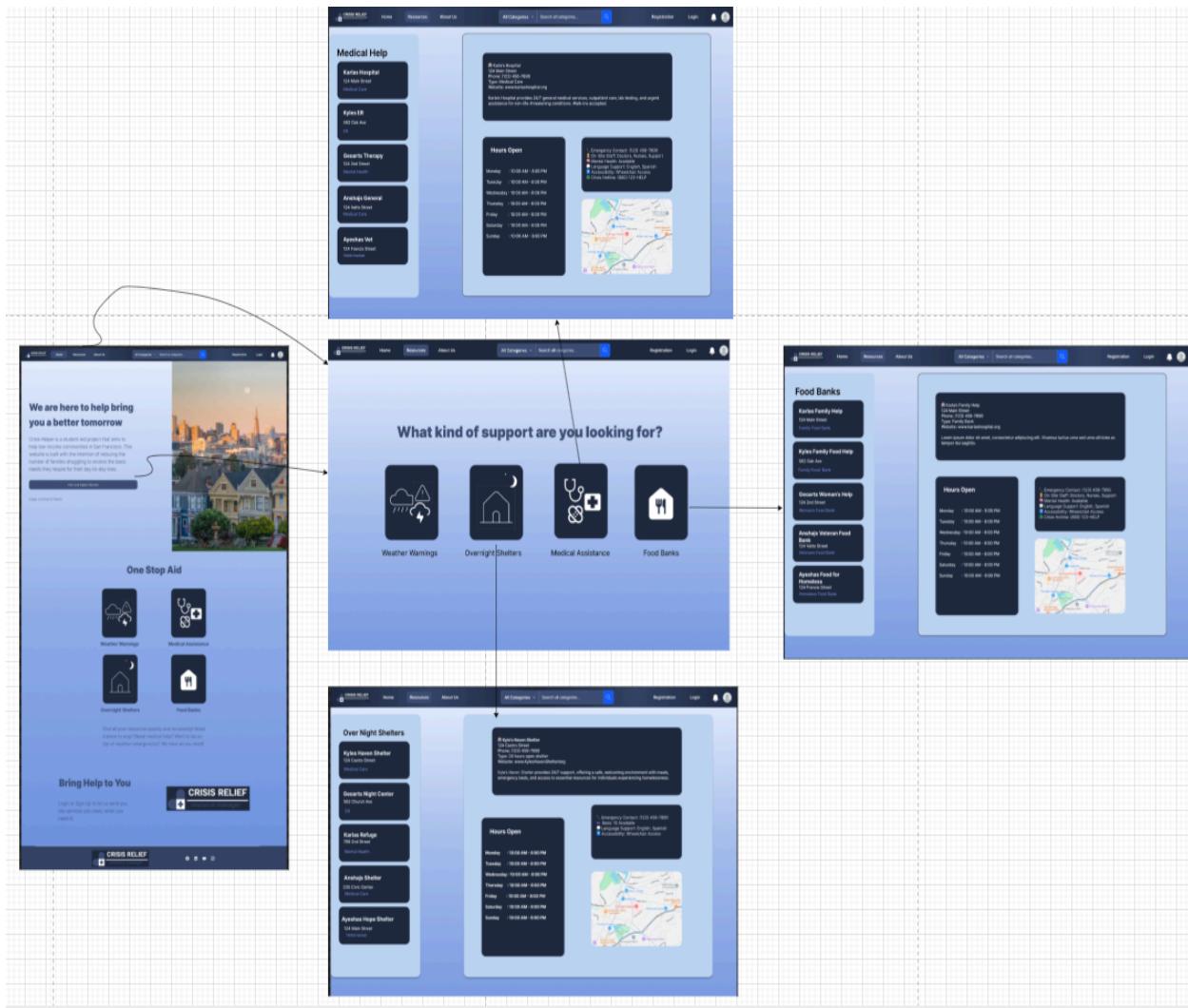
- **7.1** The system shall track and display a user's previous searches.
- **7.2** The system shall allow users to view historical data for each resource.

Priority 3 – Nice-to-Have

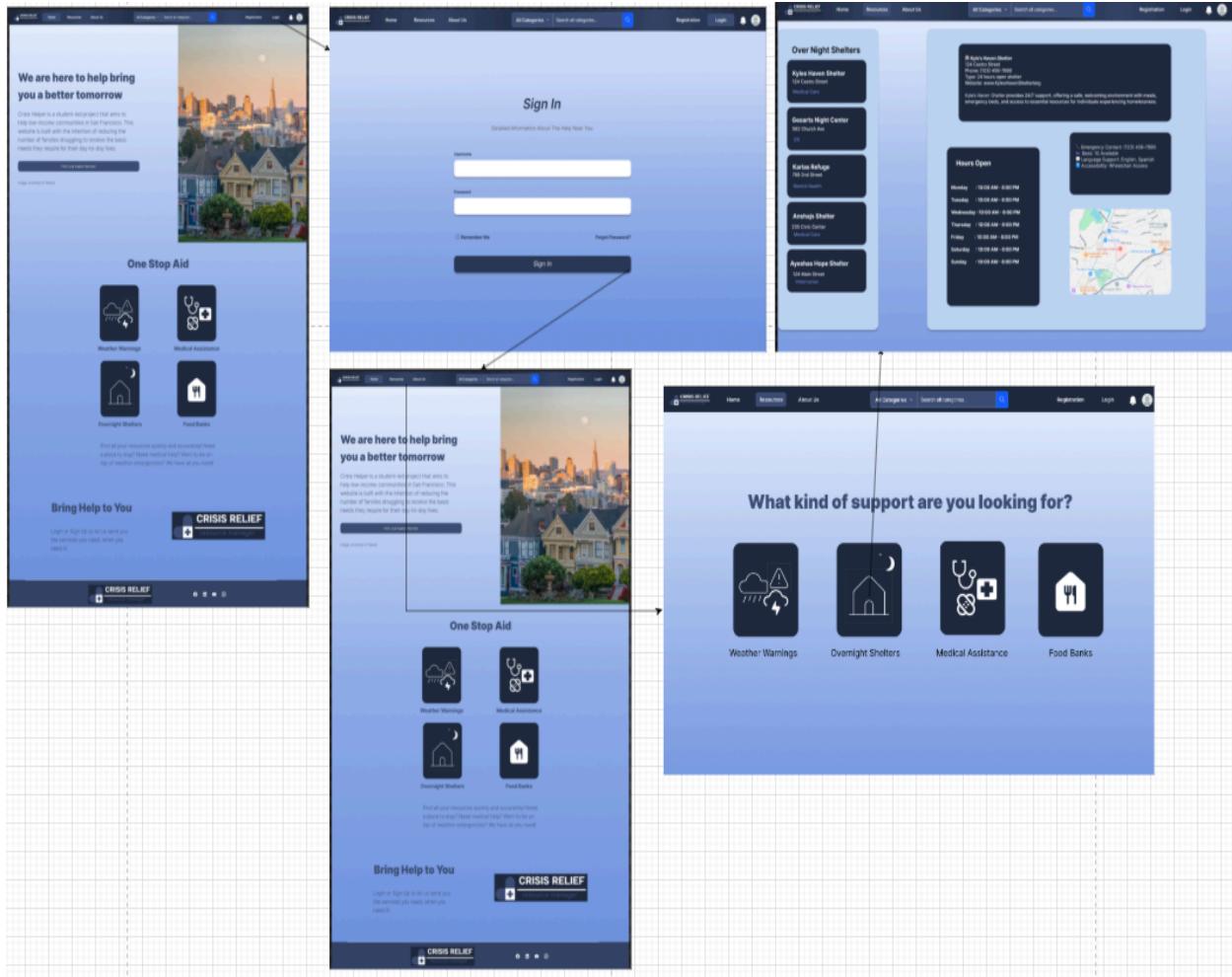
- **7.3** The system shall allow users to export their search and usage history.

UI/UX Diagrams

Use Case 1



Use Case 2



Use Case 3

The image displays three screenshots of the Crisis Relief website, showing the search interface and results for different types of support.

Screenshot 1: Home Page

We are here to help bring you a better tomorrow

Crisis Relief is a volunteer-led project that aims to help low-income communities in San Francisco. This website is built with the intention of reducing the number of times someone has to Google "What are the basic needs they require for their day-to-day life?"

Find our basic needs
View current basic needs

One Stop Aid

- Weather Warnings
- Medical Assistance
- Overnight Shelters
- Food Banks

Find all your resources quickly and conveniently! Need a place to stay? Need medical care? Want to be on top of weather emergencies? We have all you need!

Bring Help to You

Login or Sign Up to let us send you the services you need, when you need it!

CRISIS RELIEF

Screenshot 2: Resource Selection

What kind of support are you looking for?

- Weather Warnings
- Overnight Shelters
- Medical Assistance
- Food Banks

Screenshot 3: Resource Details

Over Night Shelters

- Kyle's Haven Shelter
123 Castro Street
Phone: (415) 555-1234
Type: 24 hours shelter
Website: www.KylesHavenShelter.org
- Geararts Night Center
123 Church Ave
Etc
- Kariss Refuge
123 2nd Street
Medical Needs
- Anishas Shoffer
123 3rd Street
Medical Care
- Ayshas Hope Shelter
123 Main Street
Westminster

Hours Open

Monday	- 10:00 AM - 8:00 PM
Tuesday	- 10:00 AM - 8:00 PM
Wednesday	- 10:00 AM - 8:00 PM
Thursday	- 10:00 AM - 8:00 PM
Friday	- 10:00 AM - 8:00 PM
Saturday	- 10:00 AM - 8:00 PM
Sunday	- 10:00 AM - 8:00 PM

Emergency Contact: (415) 555-7899
● Local 123 Accessibility
● Complete Refuge: Food, Shelter, Accessibility, Wheelchair Access

Map: A map of San Francisco showing the locations of various shelters and resources across the city.

Use Case 4

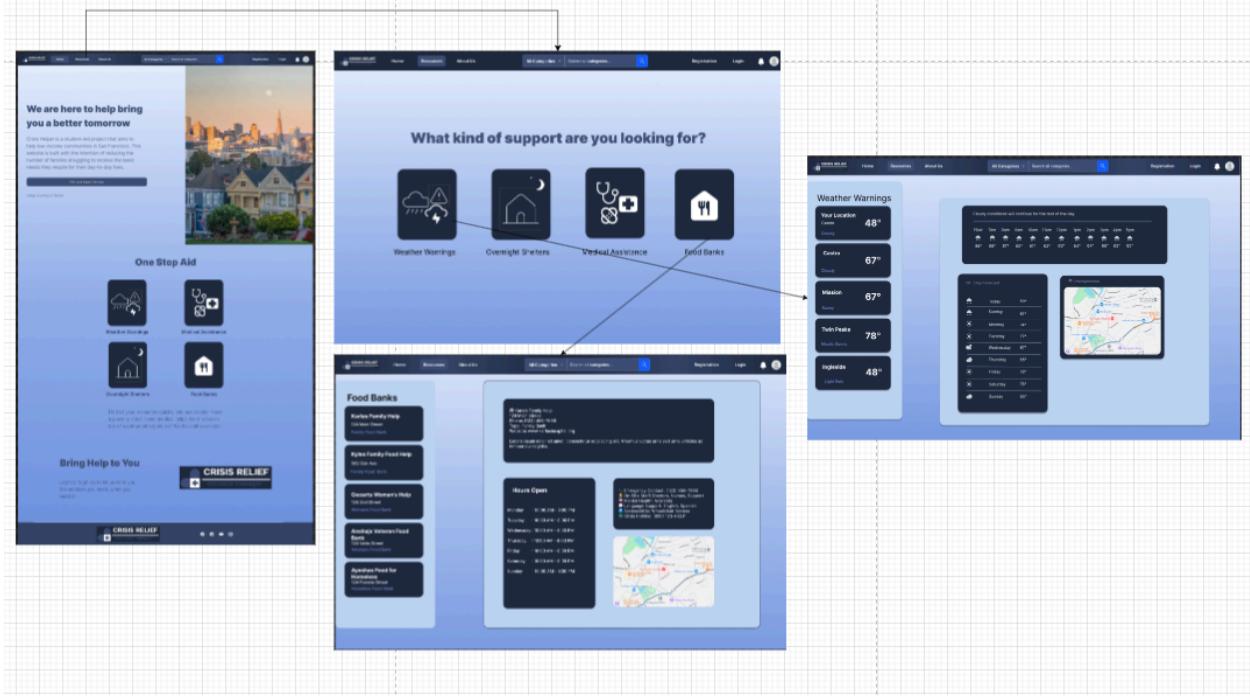
The image displays three screenshots of the Crisis Relief website, illustrating its user interface and functionality.

Top Screenshot: The homepage features a large banner with the text "We are here to help bring you a better tomorrow". Below the banner is a photograph of a San Francisco neighborhood at sunset. A sidebar on the left lists "One Stop Aid" services: Weather Warnings, Medical Assistance, Overnight Shelters, and Food Banks. At the bottom, there's a "Bring Help to You" section with a "Login or Sign Up" button and a "CRISIS RELIEF" logo.

Middle Screenshot: This screen shows a search interface with the question "What kind of support are you looking for?". It includes four categories with icons: Weather Warnings (cloud with lightning), Overnight Shelters (house with moon), Medical Assistance (stethoscope and cross), and Food Banks (fork and knife). Arrows point from the "Overnight Shelters" icon to the "Overnight Shelters" section in the bottom screenshot, and from the "Medical Assistance" icon to the "Medical Help" section in the bottom screenshot.

Bottom Screenshot: This detailed view shows the "Medical Help" section. It lists five medical facilities: Kertas Hospital, Kyles ER, Gossarts Therapy, Ansho's General, and Ayeshas Well. Each facility has a small description and a "View Details" button. To the right, there's a "Kertas Hospital" card with contact information (123 Main Street, Phone: 123-4567-8900, Email: info@kertashospital.org) and a "Hours Open" table. The table shows hours from Monday to Sunday. To the right of the table is a "Map" section with a map of a city area and a red dot indicating the hospital's location.

Use Case 5



Use Case 6

The image displays three screenshots of the Crisis Relief mobile application interface, arranged vertically. A dashed arrow points from the top-left screenshot down to the bottom-right screenshot.

Screenshot 1 (Top Left): The home screen features a banner at the top with the text "We are here to help bring you a better tomorrow". Below the banner is a large image of a city skyline at sunset. A button labeled "Get help now" is visible. The main section is titled "One Stop Aid" and includes four categories with icons: Weather Warnings, Medical Assistance, Overnight Shelters, and Food Banks. At the bottom, there's a "Bring Help to You" section with a "CRISIS RELIEF" button.

Screenshot 2 (Top Right): A navigation bar at the top includes "Home", "Resources", "About Us", "All Categories", "Search for categories", "Registration", and "Login". The main content asks "What kind of support are you looking for?" and lists four options with icons: Weather Warnings, Overnight Shelters, Medical Assistance, and Food Banks. Arrows point from the "Weather Warnings" and "Overnight Shelters" labels in the first screenshot to their respective sections here.

Screenshot 3 (Bottom): This is a detailed view of the "Weather Warnings" section. It shows a weather summary for "Your Location" (Carmel) with a current temperature of 48°. Below this are five additional locations with their temperatures: Escondido (67°), Mission (67°), Twin Peaks (78°), and Inglenook (48°). To the right, there are two panels: one showing a grid of weather icons for various hours and another showing a map of San Francisco with weather information.

Use Case 7

The image displays three screenshots of the Crisis Relief website, showing a user's journey from the homepage to a specific service page.

Screenshot 1: Home Page

We are here to help bring you a better tomorrow

Crisis Relief is a student-led project that aims to help low-income communities in San Francisco. This website is built with the intention of providing the most up-to-date information about the basic needs they require for their day-to-day lives.

One Stop Aid

Weather Warnings Medical Assistance

Overnight Shelters Food Banks

Bring Help to You

Login or Sign Up to let us send you the services you need, when you need it.

Screenshot 2: Support Types

What kind of support are you looking for?

Weather Warnings Overnight Shelters Medical Assistance Food Banks

Screenshot 3: Medical Help Page

Medical Help

Karlos Hospital
123 Main Street
Phone: 123-4567-8900
Type: Medical Care
Website: www.karloshospital.org

Karlos Hospital provides 24/7 general medical services, including care, lab testing, and urgent medical care for non-life threatening conditions. Walk-ins welcome!

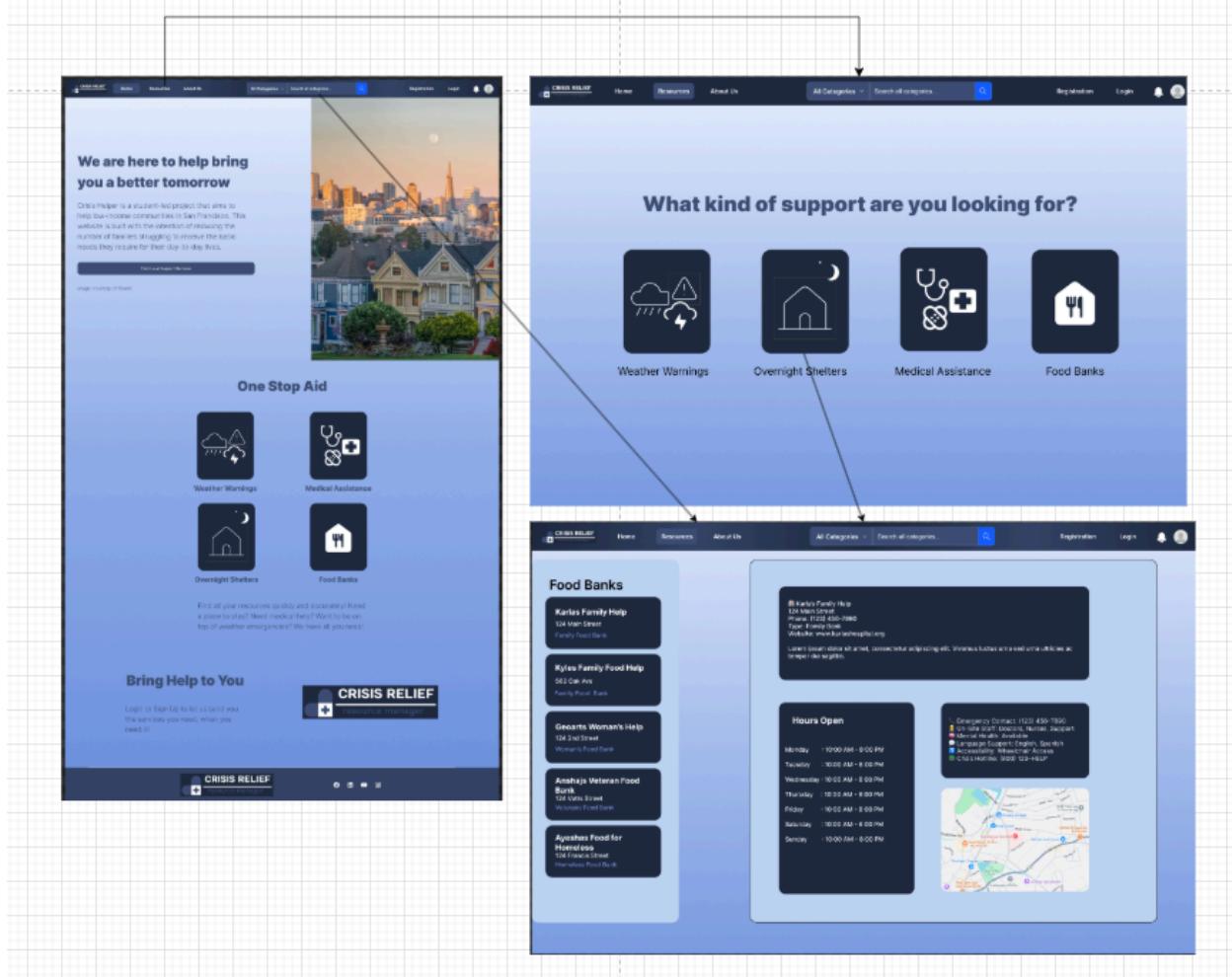
Hours Open

Monday: 10:00 AM - 6:00 PM
Tuesday: 10:00 AM - 5:00 PM
Wednesday: 10:00 AM - 8:00 PM
Thursday: 10:00 AM - 8:00 PM
Friday: 10:00 AM - 9:00 PM
Saturday: 10:00 AM - 8:00 PM
Sunday: 10:00 AM - 6:00 PM

Emergency Contact: 123-456-7890
• Doctor Staff: Dr. Smith, Dr. Johnson, Dr. Garcia
• Nurse Staff: Nurse A, Nurse B, Nurse C
• Language Support: English, Spanish
• Address: 123 Main Street, San Francisco, CA
• Crisis Hotline: 123-456-7890

Map: A map of San Francisco showing the location of Karlos Hospital and surrounding landmarks.

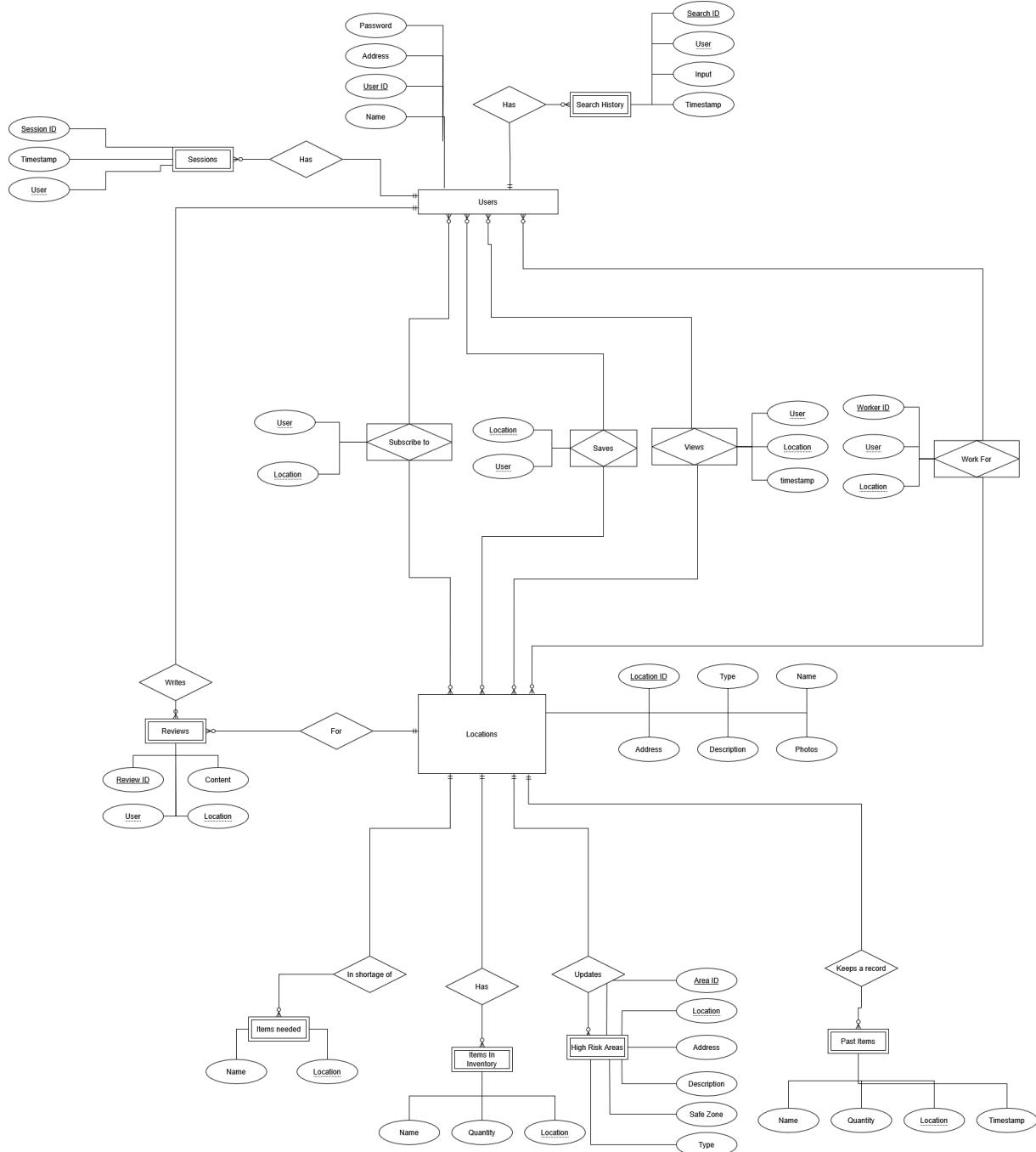
Use Case 8



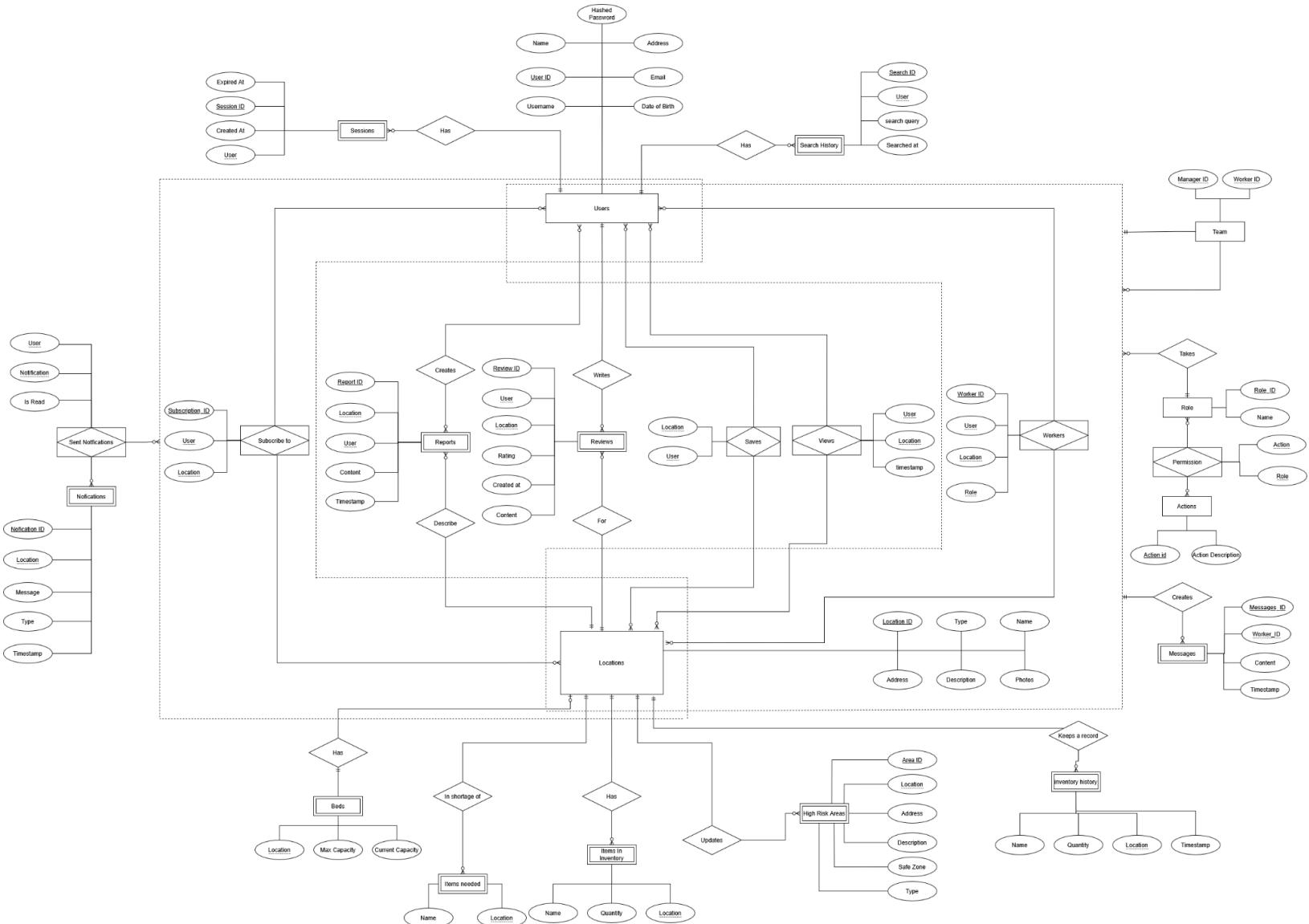
[Link to Figma file](#)

High Level System Design

Entity Diagram



EERD



Backend Architecture

We have a backend that is based on microservices, i.e., different parts of the system are independent of each other but work well together. This is more scalable, fault-tolerant, and maintainable. Instead of a single large backend, we have two primary backend servers with separate tasks.

Backend Server 1 performs Authentication & Resource Management, granting secure access to users and processing all the data related to shelters, food banks, and hospitals. Backend Server 2 performs Real-time Alerts & WebSockets, offering real-time notifications to users about emergency situations. Both servers communicate with the frontend and database via APIs and WebSockets to enable a smooth transfer of data across the system.

Backend Services and Responsibilities

Each backend service performs a specific function in processing multiple parts of the system. Backend Server 1 handles user authentication and control of required resources. Auth Service ensures users are securely authenticated by JWT (JSON Web Token) authentication and passwords are securely encrypted by bcrypt hashing. It further controls access to different features based on roles. Resource Management Service manages hospital data, food banks, and shelters. It facilitates Create, Read, Update, and Delete operations, persists data in a sharded MySQL database, and uses Redis to cache frequently read data for improved performance.

Backend Server 2 is tasked with real-time communication and notifications. The Alert Service notifies users in real-time of emergency updates, such as a shelter reaching capacity or an area becoming dangerous. Redis is used to buffer alert messages temporarily before forwarding them

to users to improve efficiency. The WebSocket Service enables live interaction, delivering real-time updates to users without requiring them to refresh their application. This service constantly awaits changes to the database and broadcasts updates through WebSockets (ws://). Organizing the backend in individual services ensures each component functions well while allowing for future expansion without major disruptions.

Scalability & Performance Considerations

To address increasing user load and ensure system stability, we have employed some mechanisms for scalability. MySQL database is sharded in a way that we do not have one large database but split data into smaller, easier-to-handle pieces. Shard 1 holds user data, while Shard 2 holds resource-related data. This reduces database overload and allows faster execution of queries.

Aside from that, we leverage read replicas for database load balancing. Instead of directing all queries to one primary database, we send read-heavy requests to read replicas to improve system responsiveness. Redis caching also improves performance by storing frequently requested data, such as shelter locations and resource status, to reduce unnecessary database queries.

To ensure easy scalability, horizontal scaling is supported in our backend, i.e., if traffic increases, we can deploy additional instances of Backend Server 1 and Backend Server 2 to handle more requests. This distributed system makes our system responsive, quick, and accessible even under high traffic.

Security Considerations

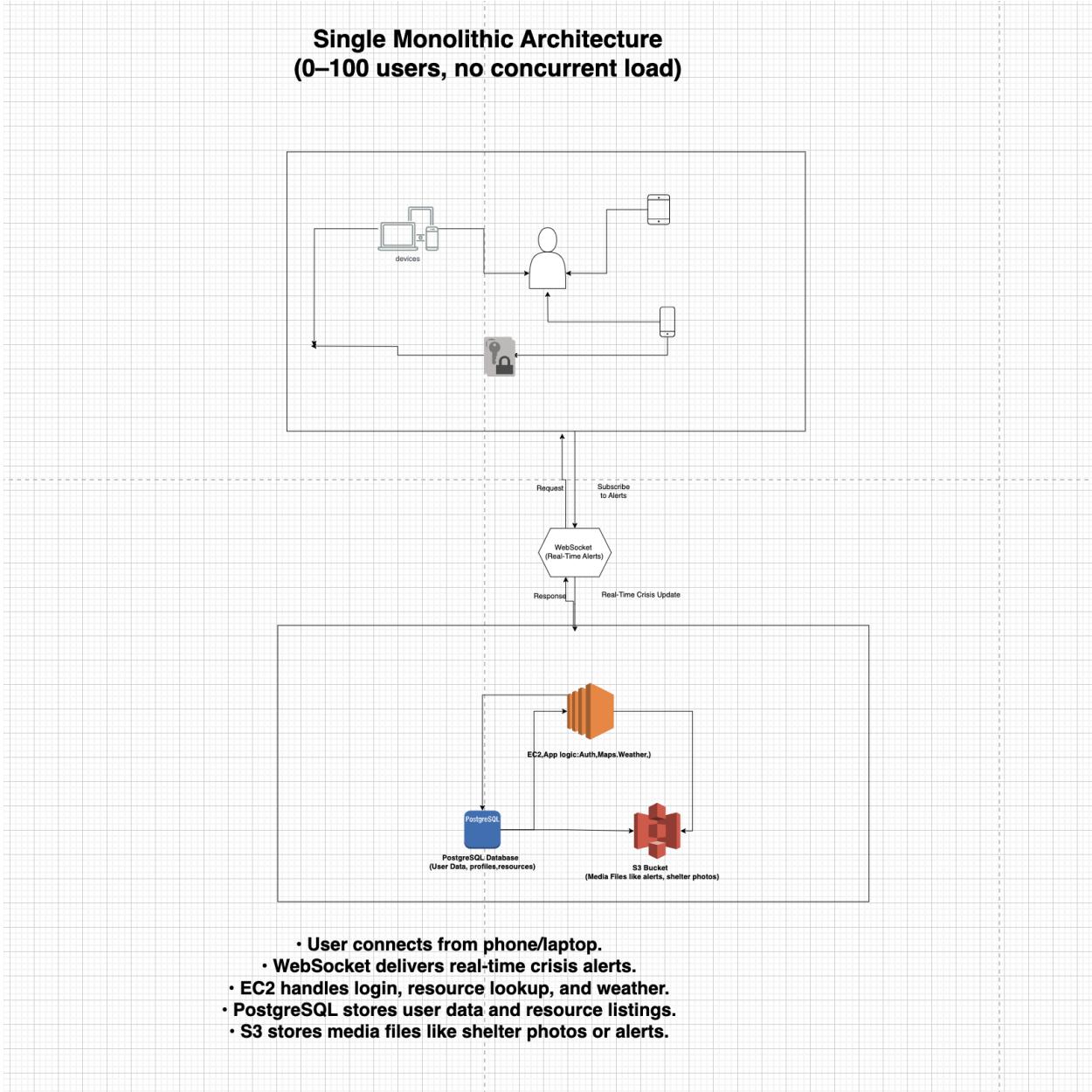
Security is given utmost priority in our backend design for the protection of the user data as well as from unauthorized access. The system follows JWT authentication for ensuring a safe session of users while accessing secured resources. API requests are protected by API Rate Limiting to avoid sending a large number of requests from a single user to avoid potential abuse as well as DDoS attacks.

All backend communications are HTTPS-encrypted, safeguarding data transfer between servers and clients. Firewalls and network limitations also ensure that only valid requests are permitted to access our backend services. These measures work together to safeguard sensitive user information and maintain system integrity.

UML Class Diagram

The UML Class Diagram represents the backend structure on the code level, breaking down how different elements communicate with each other internally. Every service, i.e., Auth Service, Resource Service, Alert Service, and WebSocket Service, is represented as a unique class. All these services talk to database models like User, Resource, and Alert, write and read accordingly. Additionally, event-driven logic and WebSockets are executed through a custom WebSocketHandler class to ensure efficient handling of real-time updates. Through the designing of the system along different object-oriented principles, we ensure the code is maintainable, reusable, and modular.

Scalability Diagrams:



System Design (10–1000+ users)

Challenges:

As more users join the crisis alert platform, we begin to experience performance bottlenecks such as delayed alerts, slower responses, and higher memory usage.

The PostgreSQL database starts struggling to handle frequent reads and writes, especially during peak crisis times.

WebSocket connections, which deliver real-time updates, begin consuming significant resources. Additionally, the current monolithic system cannot support offline alert delivery or separate responsibilities between login, data, and alert services.

Solution:

To support more users efficiently,

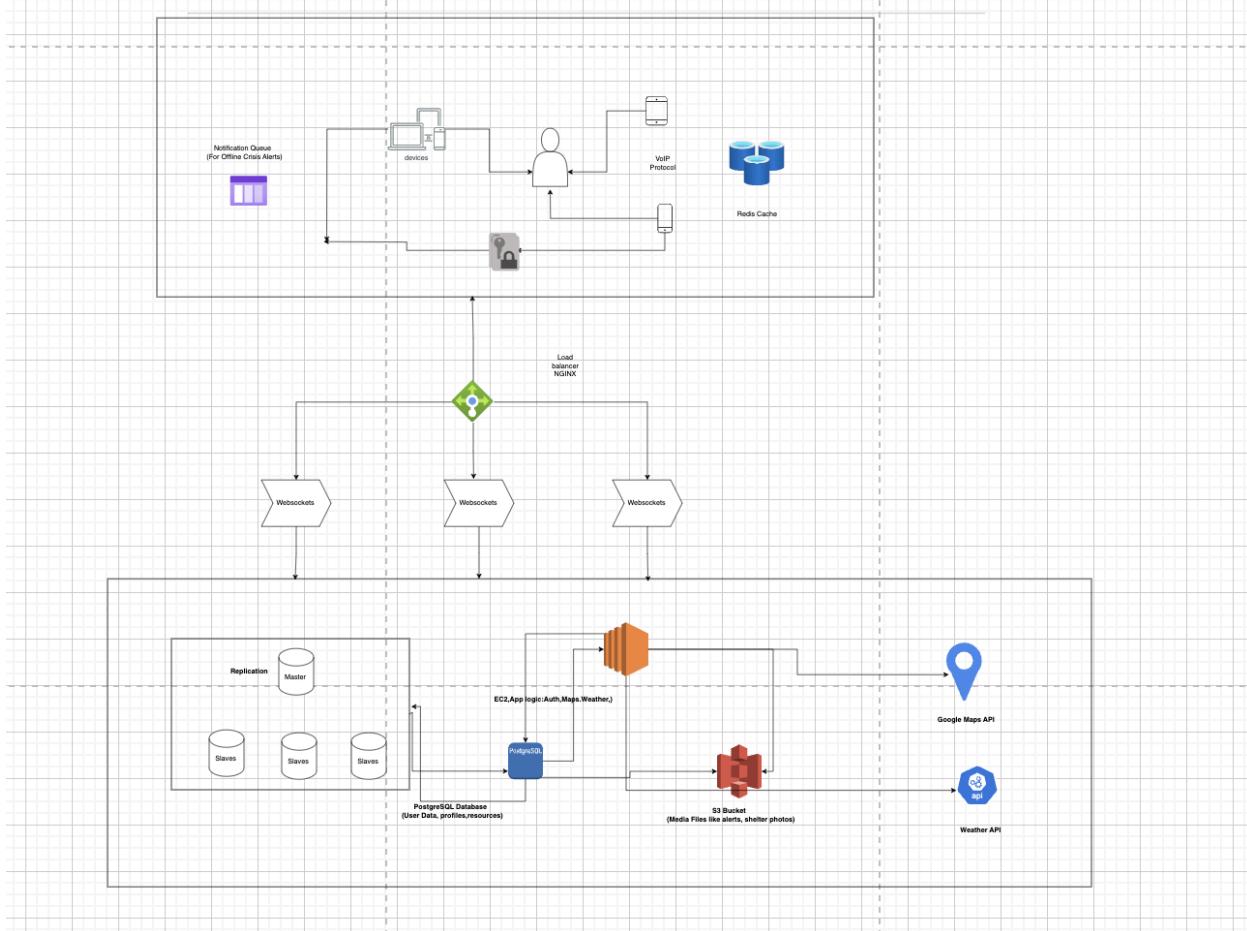
we must split the system into scalable services.

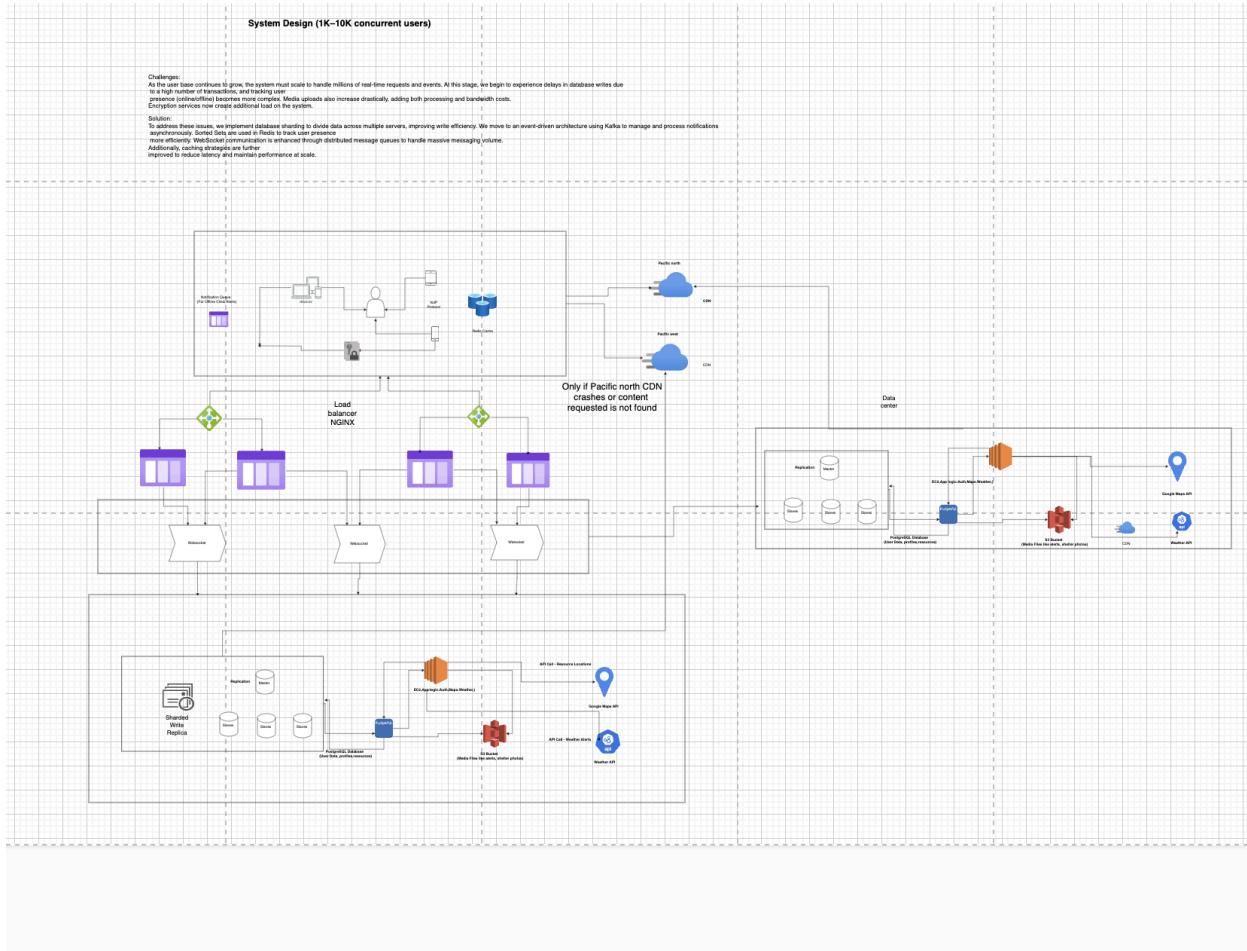
This includes creating a dedicated authentication service to

manage user sessions, a real-time alert messaging service that also stores missed alerts,

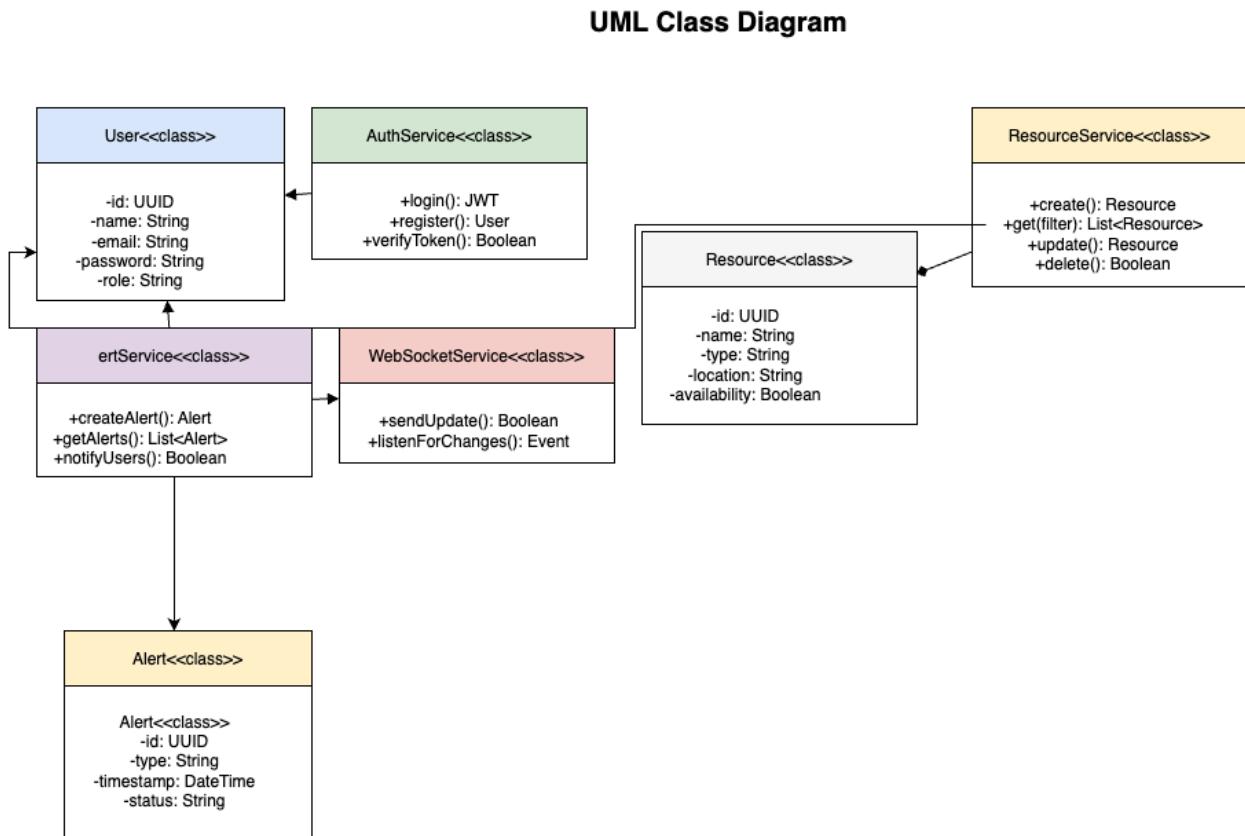
and using a CDN to serve shelter photos and weather data faster. These changes will help the platform

remain reliable, even during emergencies with thousands of users online.



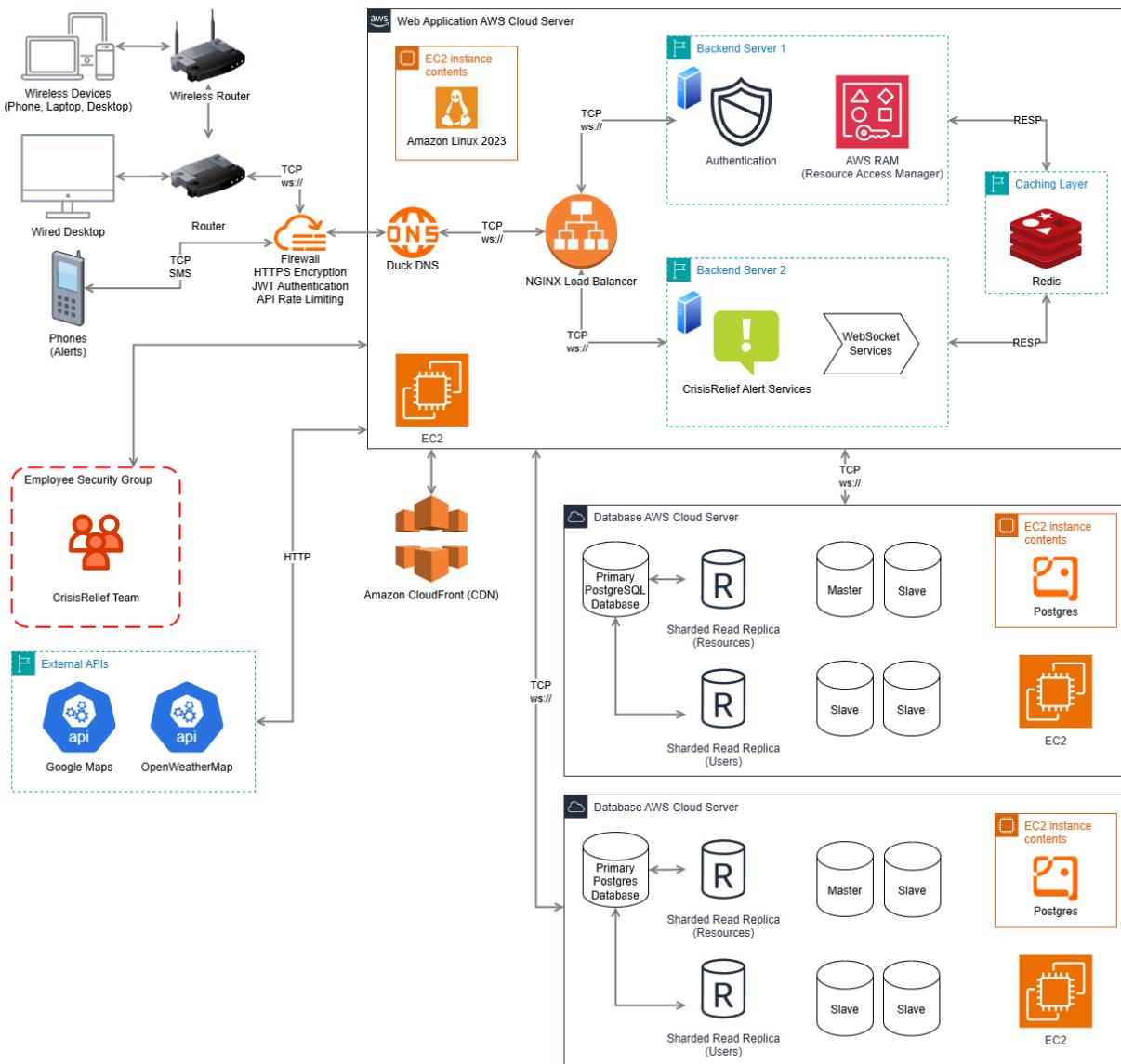


UML Class Diagram

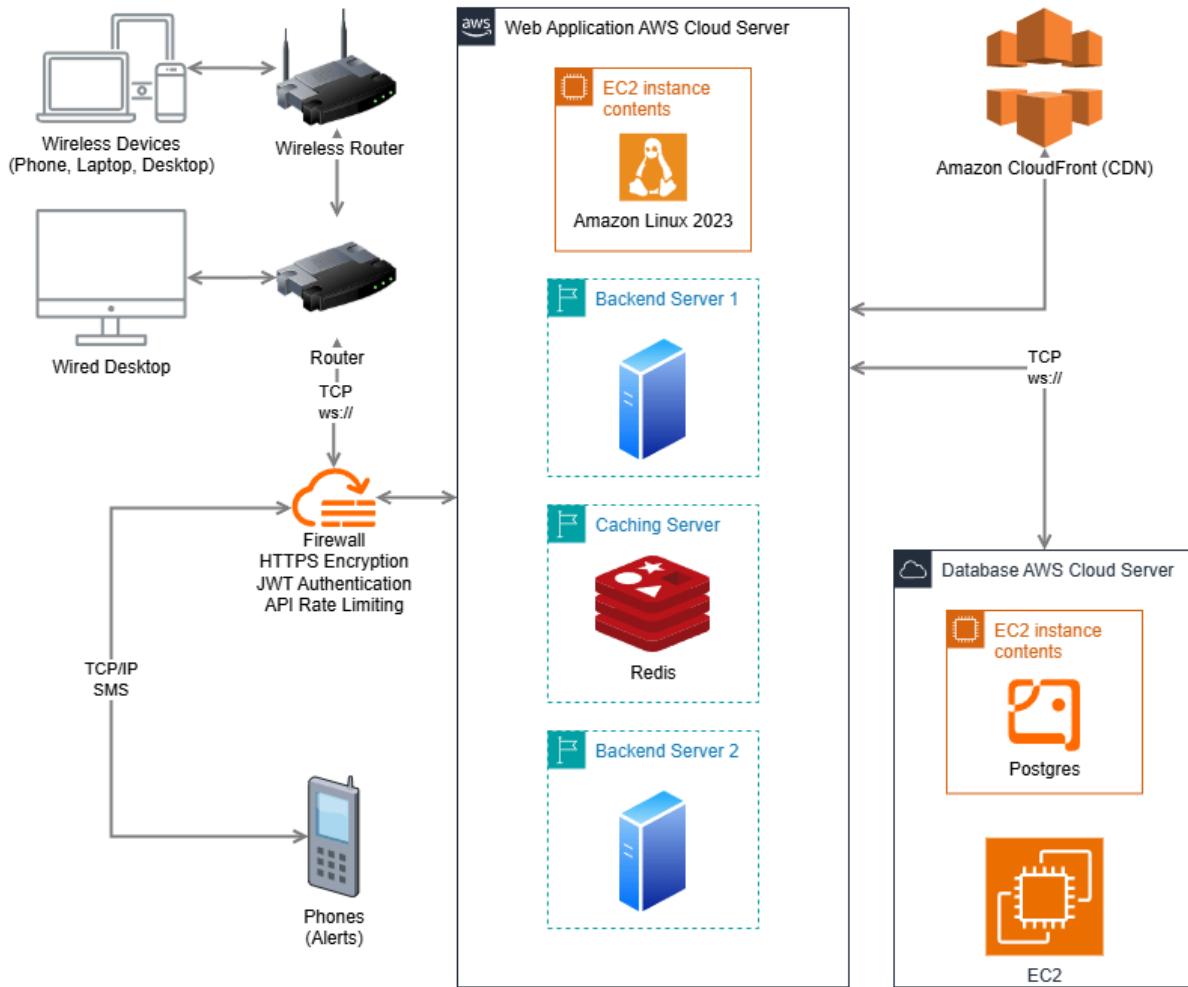


High-Level Application Network Protocols and Deployment Design

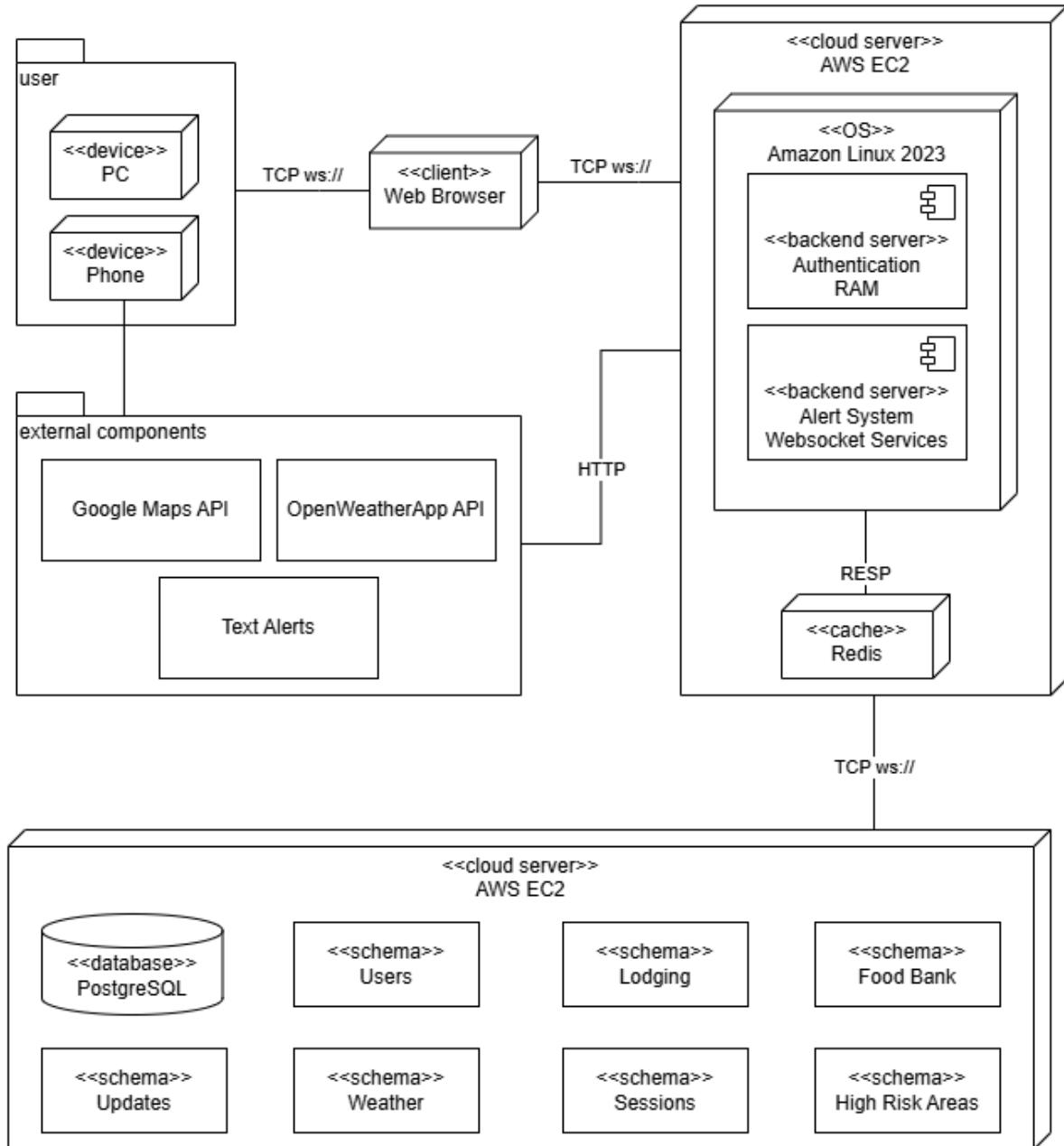
Network and Deployment Diagrams



Application Networks Diagram



Deployment Diagram



List of Team Contributions:(Team Lead)

Kyle Nguyen (Documentation Lead/ Frontend) – 10/10

- Led the documentation efforts with a strong, well-structured approach.
- Worked on the Medical Resources and Food Bank pages — designed in Figma and implemented them on the frontend.
- Delivered quality work and met internal deadlines.

Karla Cardenas Andrade (Frontend) – 8/10

- Worked on the Storyboard (Milestone 2, Version 2) and designed key pages in Figma.
- Coded the Resource and Overnight Shelter pages and designed the logo.
- However, had issues pushing code to GitHub and missed internal deadlines, which caused delays for integration.

Geoart Corral (GitHub Master/ Frontend Lead) – 10/10

- Consistently managed GitHub branches and ensured proper collaboration.
- Led the frontend team, distributed tasks, and maintained visual consistency with the gradient styling.
- Designed and developed the Home and Login pages.
- Met all internal deadlines and kept a summary of each meeting.

Ayesha Irum (Backend/ Database)– 9.5/10

- Helped salvage the backend when the original implementation fell short.
- Contributed to the database.
- Designed the high-level diagram.
- Lost points for missing internal deadlines and some backend areas still needing improvement.

Francis Aviles (Database Lead) – 7/10

- Was assigned to backend and database development, but was unable to complete key backend tasks.
- The database was not properly connected, and migration caused issues that impacted the team's progress.
- Attended meetings and contributed to documentation, but the backend responsibilities had to be picked up by others.
- Missed internal deadlines

Milestone 2 Version 2

Data Definitions

1. Users

Attribute Name	Data Type	Description
user_id	UUID (Primary key)	Identifier for user
full_name	VARCHAR(50)	User's full name
email	VARCHAR(100)	Email used for registration and log in
password_hash	VARCHAR(100)	Hashed password for security
phone_num	VARCHAR(10)	User's phone number (optional?)
role	ENUM(User,Relief Worker, Admin)	Determines access level

User Roles and Privileges

Role	Can Search for Resources	Can Post Updates	Can Approve Updates	Can Approve Updates
User	Yes	No	No	No
Relief Worker	Yes	Yes	No	No
Admin	Yes	Yes	Yes	Yes

2. Emergency Resources

Attribute Name	Data Type	Description
resource_id	UUID (Primary Key)	Unique identifier for each resource
name	VARCHAR(50)	Name of the resource
type	ENUM(SHELTER, FoodBank, MedicalCenter, MentalHealthSupport, Supply Station)	Type of resource that it is
address	VARCHAR(100)	Street address of resource
city	VARCHAR(100)	City of resource
state	VARCHAR(25)	State of resource
zip_code	VARCHAR(10)	ZIP code of resource
latitude	DECIMAL(9,6)	Latitude of resource
longitude	DECIMAL(9,6)	Longitude of resource
capacity	INT	Total Capacity of the resource (For places like shelter)
available_slots	INT	Current availability
contact_number	VARCHAR(15)	Contact Number
website_url	VARCHAR(255)	Website or official information (if they have)
open_hours	VARCHAR(100)	Operating hours
status	ENUM(Open, Full, Closed, Unknown)	Indicates current status
last_updated_at	TIMESTAMP	Timestamp of the last update

3. Weather Alerts

Attribute Name	Data Type	Description
alert_id	UUID (Primary Key)	Unique identifier for each alert
region	VARCHAR(100)	Region affected by the weather alert
alert_type	ENUM(Storm, Hurricane, Flood, Heatwave, Wildfire, Tornado, Other)	Type of weather alert
severity	ENUM(Low, Moderate, Severe, Extreme)	Severity of the weather event
description	TEXT	Description of the weather event
start_time	TIMESTAMP	When the weather event is expected to begin
end_time	TIMESTAMP	When the weather event is expected to end
created_at	TIMESTAMP	Timestamp when the alert was created

4. Notifications and Alerts

Attribute Name	Data Type	Description
notification_id	UUID (Primary Key)	Unique identifier for each notification
user_id	UUID (Foreign Key)	User receiving the notification
message	TEXT	Content of notification
type	ENUM(WeatherAlert, ResourceUpdate, SystemUpdate)	Category of notification
is_read	BOOLEAN	Indicates if the user has seen the notification
created_at	TIMESTAMP	Timestamp when the notification was sent

5. Feedback

Attribute Name	Data Type	Description
review_id	UUID (Primary Key)	Unique identifier for each review
user_id	UUID (Foreign Key)	User who wrote the review
resource_id	UUID (Foreign Key)	Resource being reviewed
rating	INT	Rating (1-5)
comment	TEXT	User feedback
created_at	TIMESTAMP	Date and time the review was submitted

6. Search and Personal Data

Attribute Name	Data Type	Description
search_id	UUID (Primary Key)	Unique identifier for each search query
user_id	UUID (Foreign Key)	User who performed the search
query	VARCHAR(150)	User's search input
results_count	INT	Number of results returned
selected_result_id	UUID (Foreign Key)	ID of the resource selected by the user
timestamp	TIMESTAMP	Time of the search

Prioritized High Level Functional Requirements

Priority 1 – Critical (API Integrations & Core System Features)

1. API Integrations for Emergency Resources

- 1.1 The system shall integrate Google Maps API to provide real-time directions to emergency shelters, food banks, and medical centers.
- 1.2 The system shall integrate OpenWeatherMap API to display weather conditions that affect access to resources.
- 1.3 The system shall integrate real-time APIs from relief organizations (if available) to fetch live shelter and food bank data.
- 1.4 The system shall allow users to search for nearby emergency shelters based on real-time API data.
- 1.5 The system shall display real-time availability of emergency shelters retrieved from API updates.
- 1.6 The system shall notify users of real-time updates on shelter capacity, utilizing data from APIs or relief workers.
- 1.7 The system shall display real-time food bank inventory using APIs or relief worker updates.
- 1.8 The system shall notify users of weather alerts that impact food bank accessibility, using OpenWeatherMap API.
- 1.9 The system shall allow users to search for medical resources and provide real-time availability using API data.
- 1.10 The system shall provide directions to the nearest emergency resources using Google Maps API.
- 1.11 The system shall display real-time traffic conditions affecting travel time to emergency resources.

2. User Authentication

- 2.1 The system shall allow users to register using their email and password.
- 2.2 The system shall allow users to log in securely using their registered credentials.
- 2.3 The system shall implement session timeout functionality to ensure secure access.
- 2.4 Passwords shall be encrypted securely using industry-standard hashing (e.g., bcrypt).
- 2.5 The system shall ensure that user sessions are managed securely using JWT tokens.

3. Notifications & Alerts (API-Based)

- 3.1 The system shall alert users with real-time weather updates using OpenWeatherMap API.
- 3.2 The system shall notify users of real-time updates on shelter capacity, based on API or relief worker input.
- 3.3 The system shall notify users of real-time updates on food bank availability and restocking, using API integrations.
- 3.4 The system shall notify users of medical resource availability changes using API data.
- 3.5 The system shall allow users to set alerts for weather conditions impacting resource access.

Priority 2 – Important (User Input & Reviews)

4. User-Generated Data & Feedback

- 4.1 The system shall allow relief workers to update shelter capacity manually if API data is unavailable.
- 4.2 The system shall allow relief workers to update food bank inventory manually.
- 4.3 The system shall allow relief workers to mark shortages of supplies (e.g., water, blankets).
- 4.4 The system shall allow relief workers to update medical center availability.

5. User Experience & Review System

- 5.1 The system shall allow users to submit reviews and ratings for shelters, food banks, and medical centers.
- 5.2 The system shall display average ratings and user reviews for each resource.
- 5.3 The system shall allow users to flag inaccurate resource information for admin review.
- 5.4 The system shall allow users to customize notification preferences (e.g., food bank restocking alerts, weather changes).

6. Mobile Optimization

- 6.1 The system shall provide a responsive mobile-friendly design.
- 6.2 The system shall allow users to save favorite locations for quick access.
- 6.3 The system shall allow users to receive notifications on new shelters or food banks in their area.
- 6.4 The system shall provide offline mode for saved resource data, allowing users to access shelter and food bank information without an internet connection.

Priority 3 – Nice-to-Have (Future Enhancements)

7. Advanced Search & Personalization

- 7.1 The system shall provide a search history feature for users.
- 7.2 The system shall allow users to filter search results by resource type, availability, and distance.
- 7.3 The system shall allow users to share resource information via social media or email.

8. Data Tracking & Analytics

- 8.1 The system shall allow users to view historical data on resource availability.
- 8.2 The system shall allow relief workers to generate reports on resource shortages and availability.
- 8.3 The system shall allow system administrators to generate reports on system usage.
- 8.4 The system shall enable system administrators to manage database backups and monitor performance.

9. Team Collaboration & Accessibility

- 9.1 The system shall enable relief workers to communicate with each other via an internal chat system.
- 9.2 The system shall provide multilingual support for users in disaster-prone regions.
- 9.3 The system shall provide accessibility features, including screen readers, high-contrast modes, and text resizing options.

10. Security & Performance Enhancements

- 10.1 The system shall allow system administrators to update the system with new features.
- 10.2 The system shall enable system administrators to manage system maintenance schedules.
- 10.3 The system shall allow system administrators to monitor and manage API usage.
- 10.4 The system shall allow system administrators to manage third-party integrations.

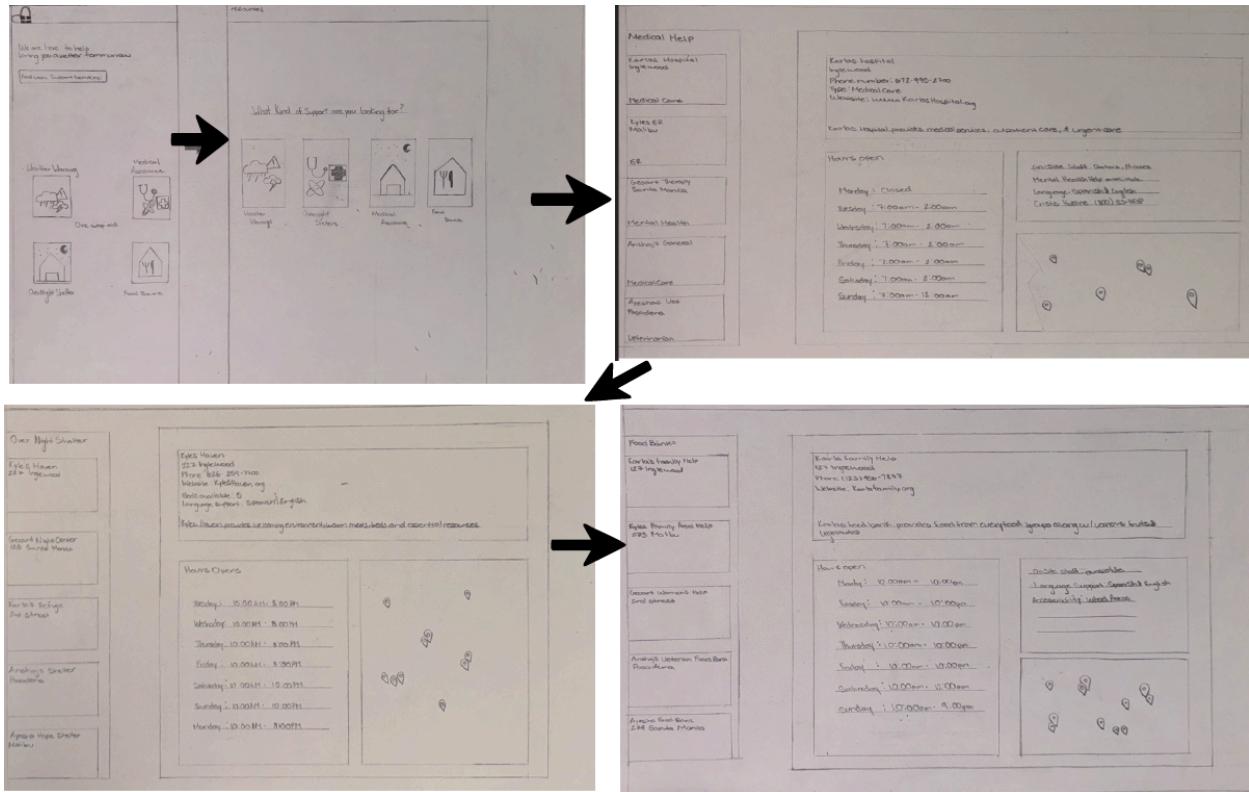
Summary of Changes from Milestone 1

1. Reprioritized Features

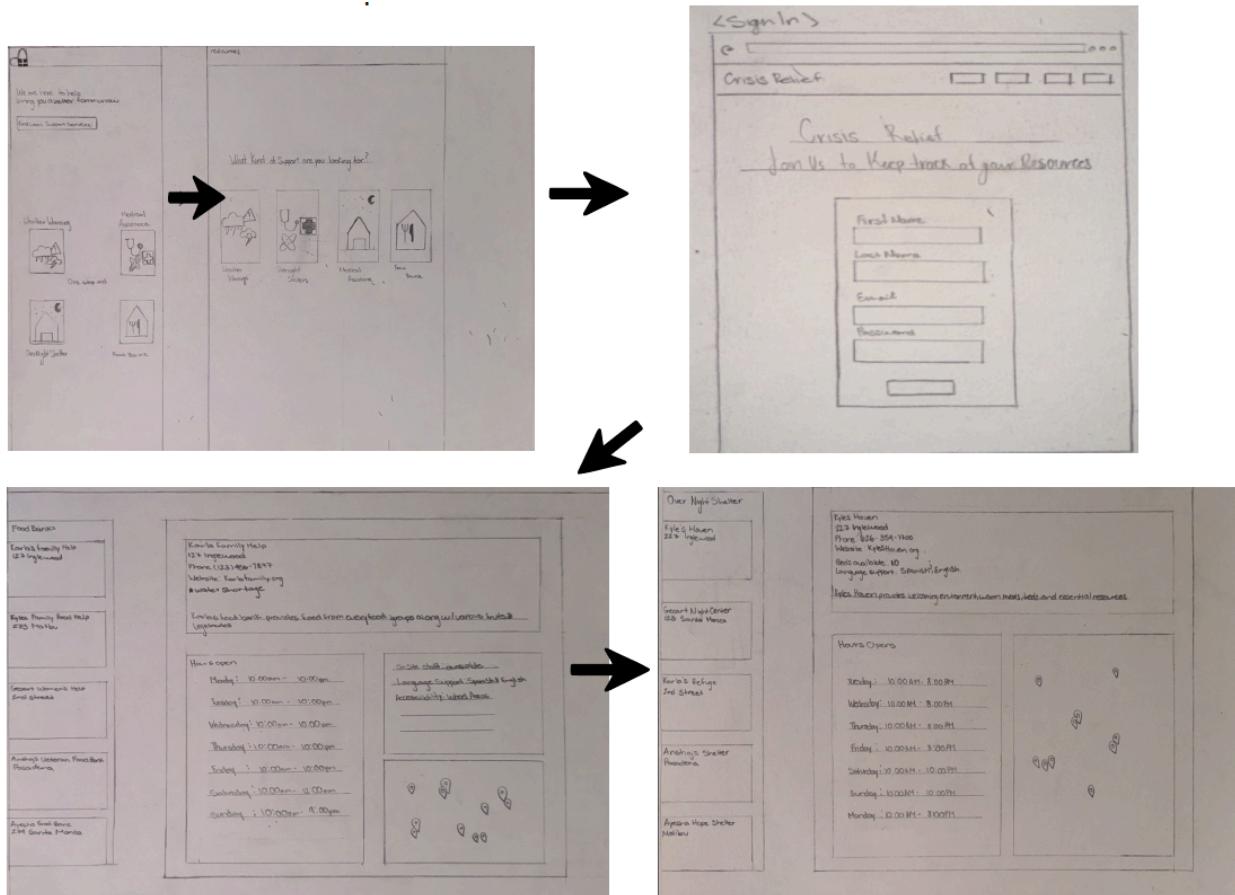
- Priority 1 now focuses on API integrations and real-time data (shelter availability, food bank stock, weather alerts).
- Priority 2 focuses on user-generated data and mobile optimization.
- Priority 3 includes advanced analytics, communication, and extra security features.
- Shortened and combined so we don't have as many as before

Mockups/Storyboards

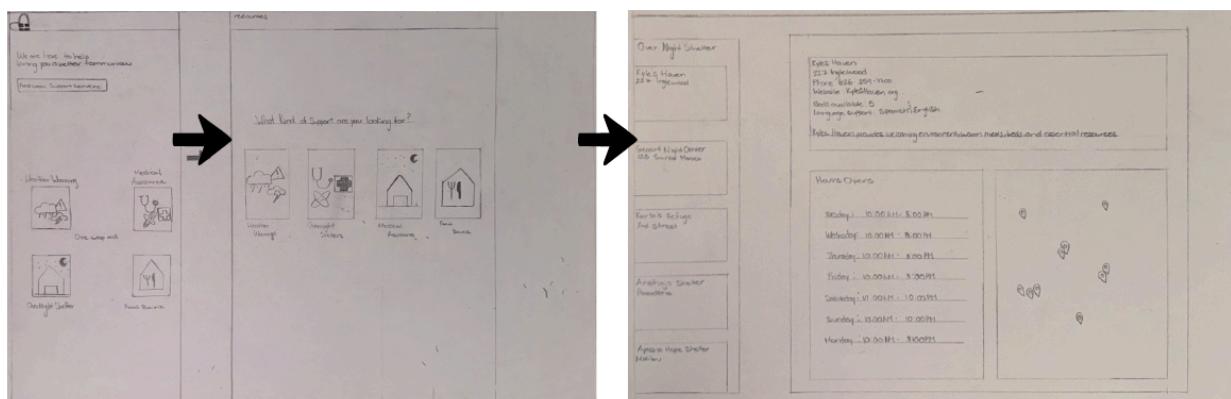
Use Case 1: Finding Emergency Resources Mockup



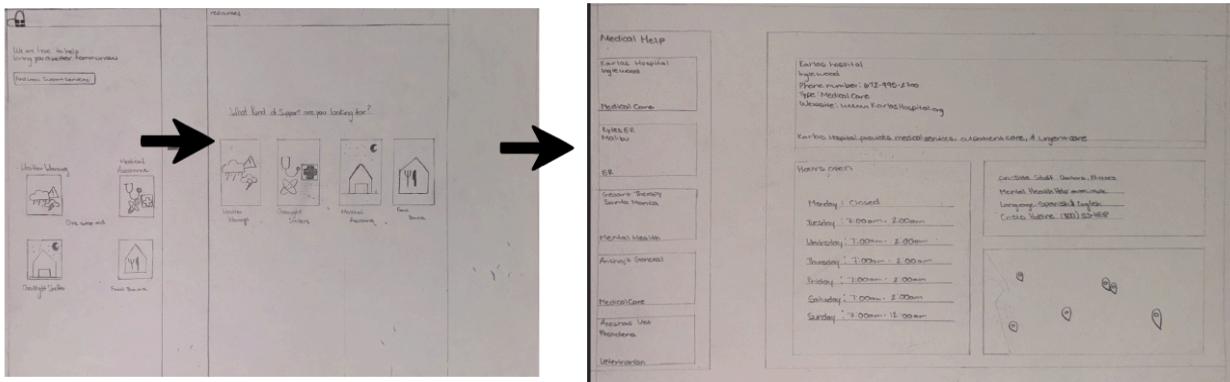
Use Case 2: Real Time Updates Mockup



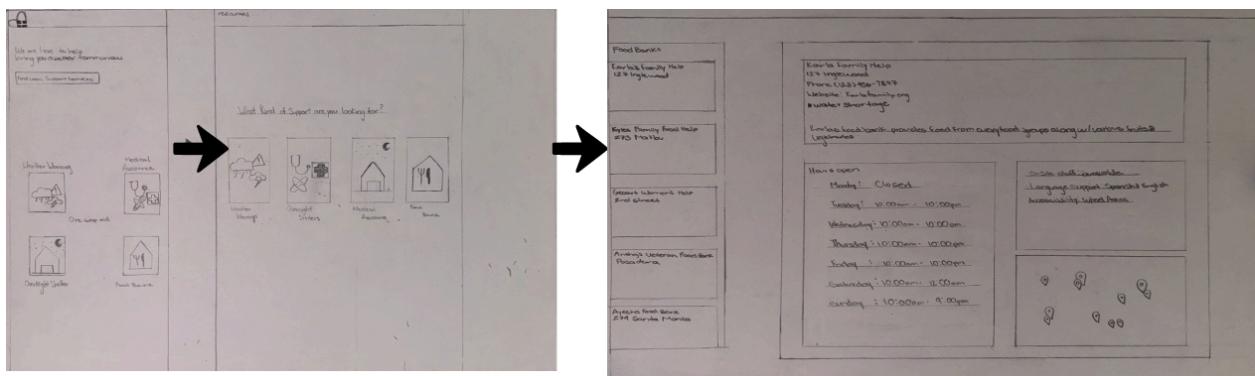
Use Case 3: Shelter Locator Mockup



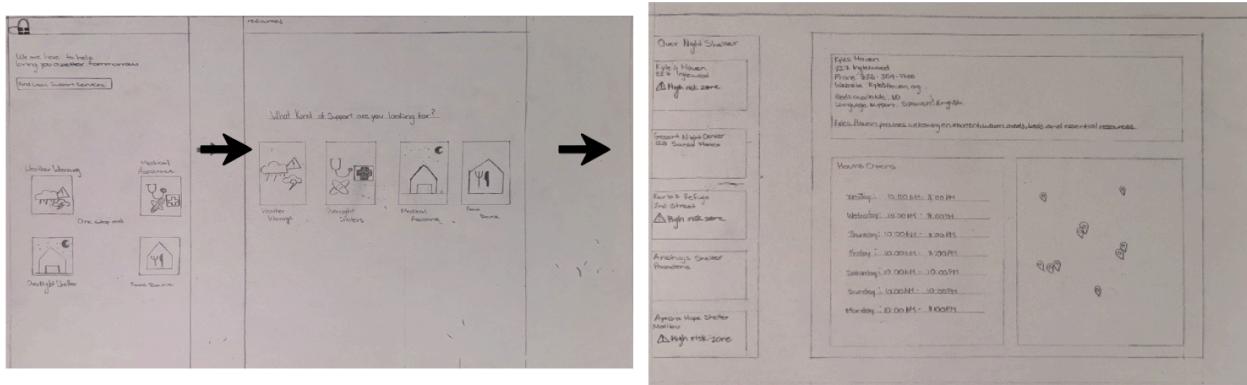
Use Case 4: Medical Assistance Mockup



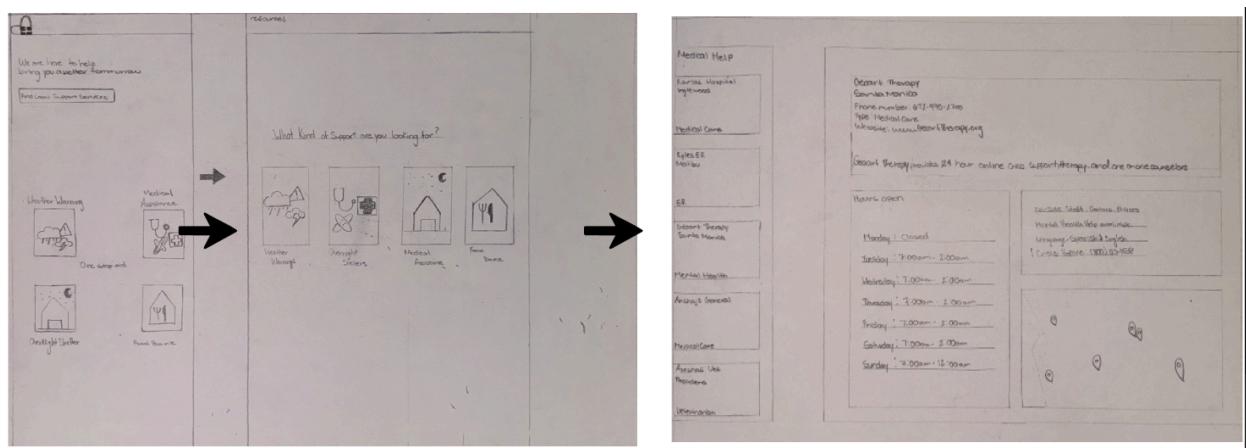
Use Case 5: Real-Time Weather Warnings on Resource Pages Mockup



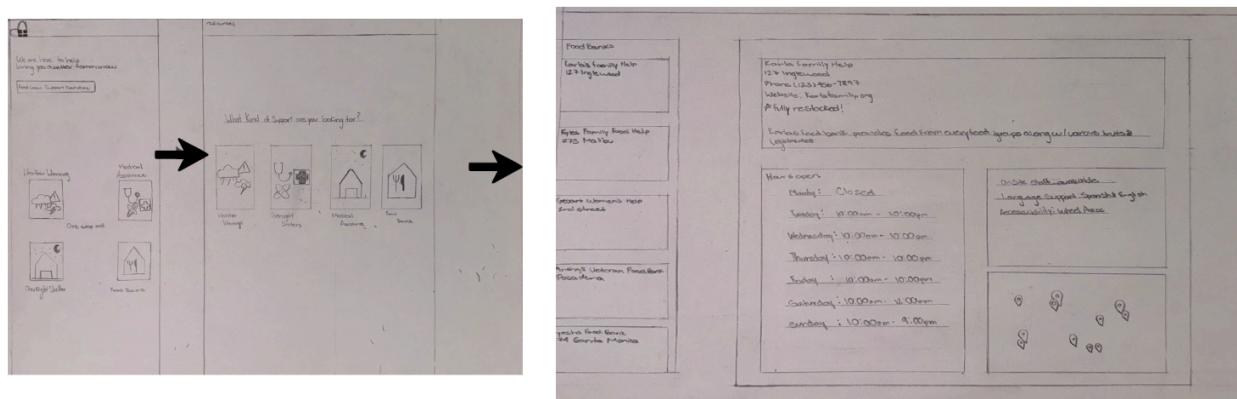
Use Case 6: Identifying High Risk Areas and Safe Zones Mockup



Use Case 7: Mental Health Support Review Mockup



Use Case 8: Food Bank Real-Time Update Mockup



High-Level System Design

High-Level Database Architecture

- Workers
 - The database shall allow workers to update the stock of locations.
 - The database shall allow workers to update only their places of work.
 - The database shall allow workers to create high risk areas and safe zones.
- Locations
 - The database shall return details of locations such as address, contact info, and operating hours to anyone who requests.
 - The database shall store the history of the location's resources.
 - The database shall store reviews of locations.
 - The database shall allow anyone to view reviews.
 - The database shall allow users to submit reviews.
- Users
 - The database shall store users' saved locations.
 - The user shall only have access to their own saved locations.
 - The database shall store users' search history.
 - The user shall only have access to their own history.
 - Database shall store sessions tokens for users that will only last 5 hours.
- Administration
 - The database shall store user roles and permissions.

- The database shall allow system administrators to configure only their user roles and permissions.

DBMS Selection

For our database management system we will be using PostgreSQL, as it has more features and is able to do more complex tasks.

Database Organization

- Users
 - Attributes
 - Password, User ID (Primary key), Address, Search History, Name
 - Relationships
 - Writes Reviews, in a one to many relationship
 - Has sessions, in a one to one relationship
 - Saves locations in a many to many relationship
- Workers
 - Is a user
 - Relationships
 - Updates locations, in a many to many relationship
 - Updates High Risk Areas in a many to many relationship
- Session
 - Attributes
 - Session ID (Primary key), User (Foreign key)
 - Relationships
 - Belong to a user in a one to one relationship

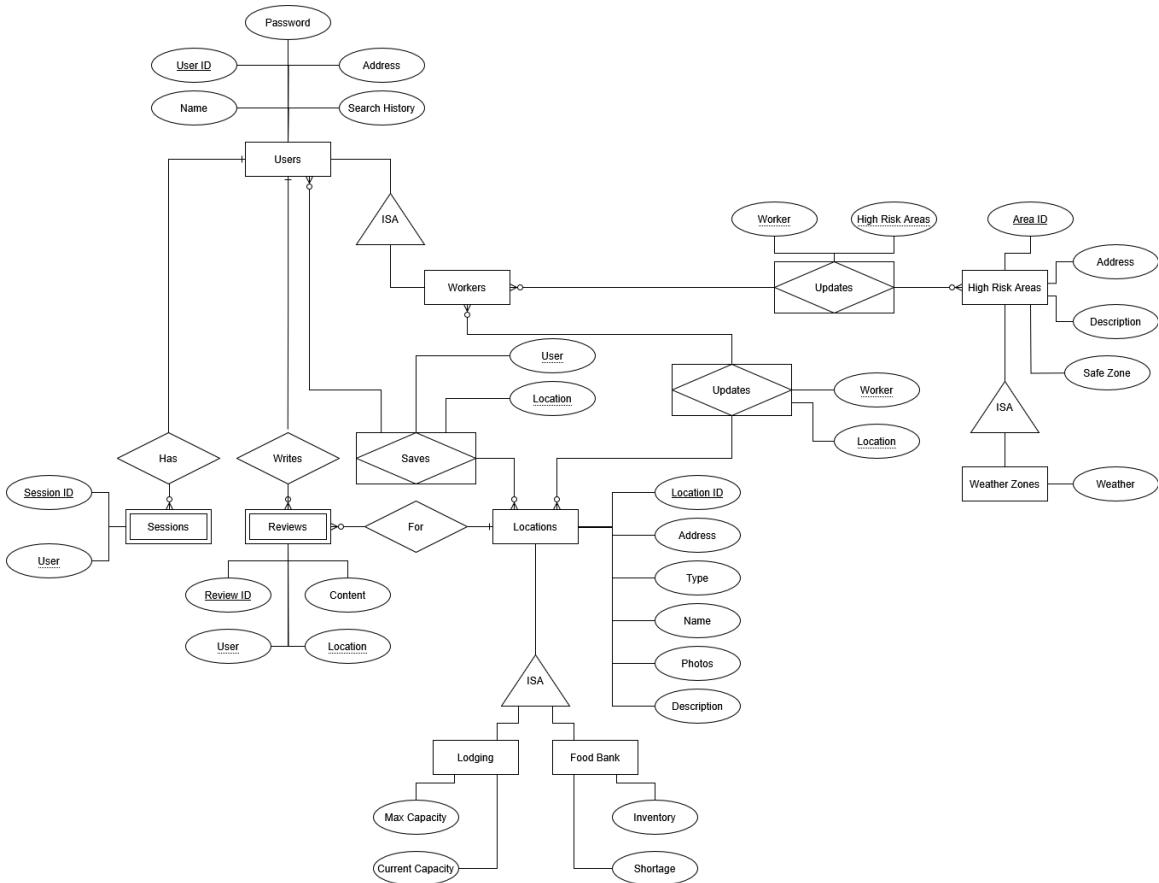
- Reviews
 - Attributes
 - Review ID (Primary key), User (Foreign key), Location (Foreign Key), content
 - Relationship
 - Belongs to the user in a one to many relationship
 - About locations in a many to one relationship
- Locations
 - Attributes
 - Location ID (Primary Key), Address, Types, Name, Photos, Description
 - Relationship
 - Have reviews in a one to many relationship
 - Updated by workers in a many to many relationship
 - Saved by users in a many to many relationship
- Lodging
 - Is a locations
 - Attributes
 - Max capacity, Current Capacity
- Food bank
 - Is a location
 - Attributes

- Inventory, Shortage
- High Risk Areas
 - Attributes
 - Area ID (Primary Key), Address, Description, safe zone
 - Relationships
 - Updated by workers in a many to many relationship
- Weather zones
 - Is a High Risk area
 - Attributes
 - Weather

Media Storage

We shall store the images and review contents inside the database as BLOBs.

Entity Diagram



Backend Architecture

We have a backend that is based on microservices, i.e., different parts of the system are independent of each other but work well together. This is more scalable, fault-tolerant, and maintainable. Instead of a single large backend, we have two primary backend servers with separate tasks.

Backend Server 1 performs Authentication & Resource Management, granting secure access to users and processing all the data related to shelters, food banks, and hospitals. Backend Server 2 performs Real-time Alerts & WebSockets, offering real-time notifications to users about emergency situations. Both servers communicate with the frontend and database via APIs and WebSockets to enable a smooth transfer of data across the system.

Backend Services and Responsibilities

Each backend service performs a specific function in processing multiple parts of the system. Backend Server 1 handles user authentication and control of required resources. Auth Service ensures users are securely authenticated by JWT (JSON Web Token) authentication and passwords are securely encrypted by bcrypt hashing. It further controls access to different features based on roles. Resource Management Service manages hospital data, food banks, and shelters. It facilitates Create, Read, Update, and Delete operations, persists data in a sharded MySQL database, and uses Redis to cache frequently read data for improved performance.

Backend Server 2 is tasked with real-time communication and notifications. The Alert Service notifies users in real-time of emergency updates, such as a shelter reaching capacity or an area becoming dangerous. Redis is used to buffer alert messages temporarily before forwarding them

to users to improve efficiency. The WebSocket Service enables live interaction, delivering real-time updates to users without requiring them to refresh their application. This service constantly awaits changes to the database and broadcasts updates through WebSockets (ws://). Organizing the backend in individual services ensures each component functions well while allowing for future expansion without major disruptions.

Scalability & Performance Considerations

To address increasing user load and ensure system stability, we have employed some mechanisms for scalability. MySQL database is sharded in a way that we do not have one large database but split data into smaller, easier-to-handle pieces. Shard 1 holds user data, while Shard 2 holds resource-related data. This reduces database overload and allows faster execution of queries.

Aside from that, we leverage read replicas for database load balancing. Instead of directing all queries to one primary database, we send read-heavy requests to read replicas to improve system responsiveness. Redis caching also improves performance by storing frequently requested data, such as shelter locations and resource status, to reduce unnecessary database queries.

To ensure easy scalability, horizontal scaling is supported in our backend, i.e., if traffic increases, we can deploy additional instances of Backend Server 1 and Backend Server 2 to handle more requests. This distributed system makes our system responsive, quick, and accessible even under high traffic.

Security Considerations

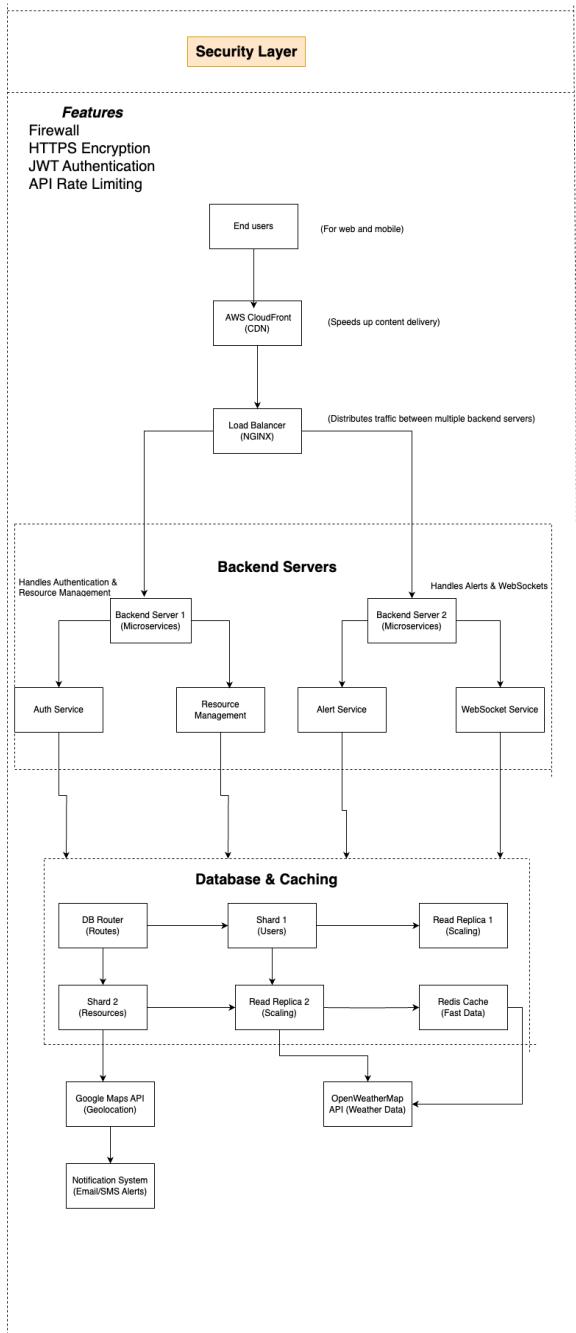
Security is given utmost priority in our backend design for the protection of the user data as well as from unauthorized access. The system follows JWT authentication for ensuring a safe session of users while accessing secured resources. API requests are protected by API Rate Limiting to avoid sending a large number of requests from a single user to avoid potential abuse as well as DDoS attacks.

All backend communications are HTTPS-encrypted, safeguarding data transfer between servers and clients. Firewalls and network limitations also ensure that only valid requests are permitted to access our backend services. These measures work together to safeguard sensitive user information and maintain system integrity.

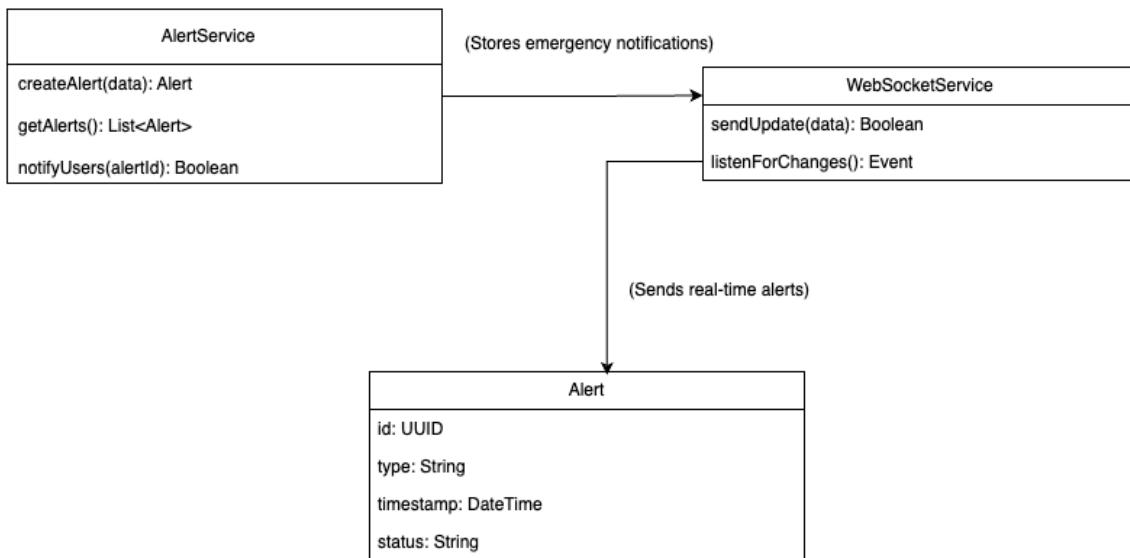
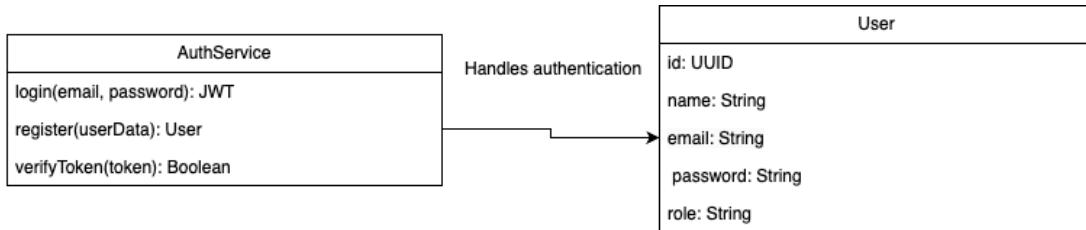
UML Class Diagram

The UML Class Diagram represents the backend structure on the code level, breaking down how different elements communicate with each other internally. Every service, i.e., Auth Service, Resource Service, Alert Service, and WebSocket Service, is represented as a unique class. All these services talk to database models like User, Resource, and Alert, write and read accordingly. Additionally, event-driven logic and WebSockets are executed through a custom WebSocketHandler class to ensure efficient handling of real-time updates. Through the designing of the system along different object-oriented principles, we ensure the code is maintainable, reusable, and modular.

Scalability Diagrams:

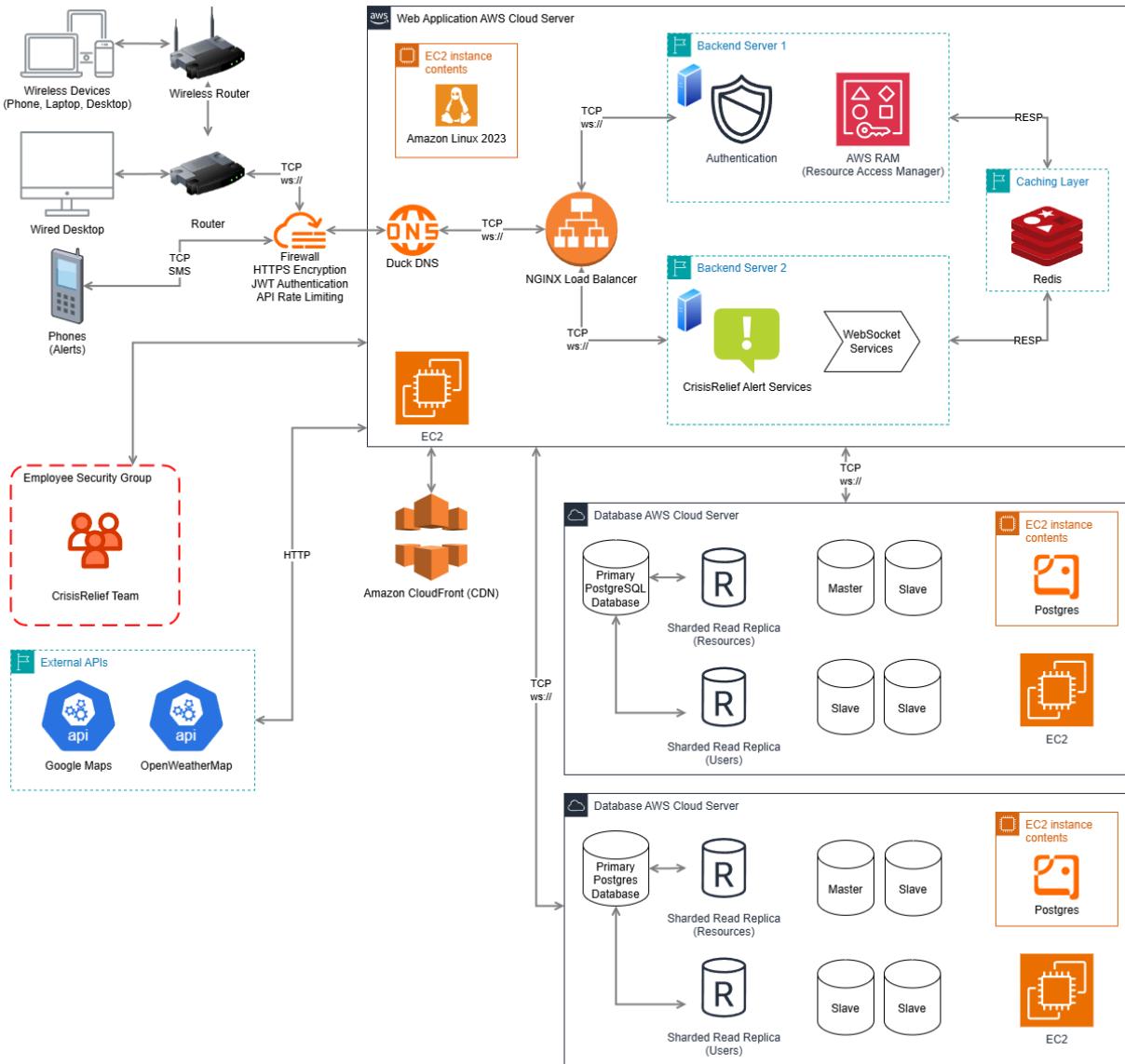


UML Class Diagram

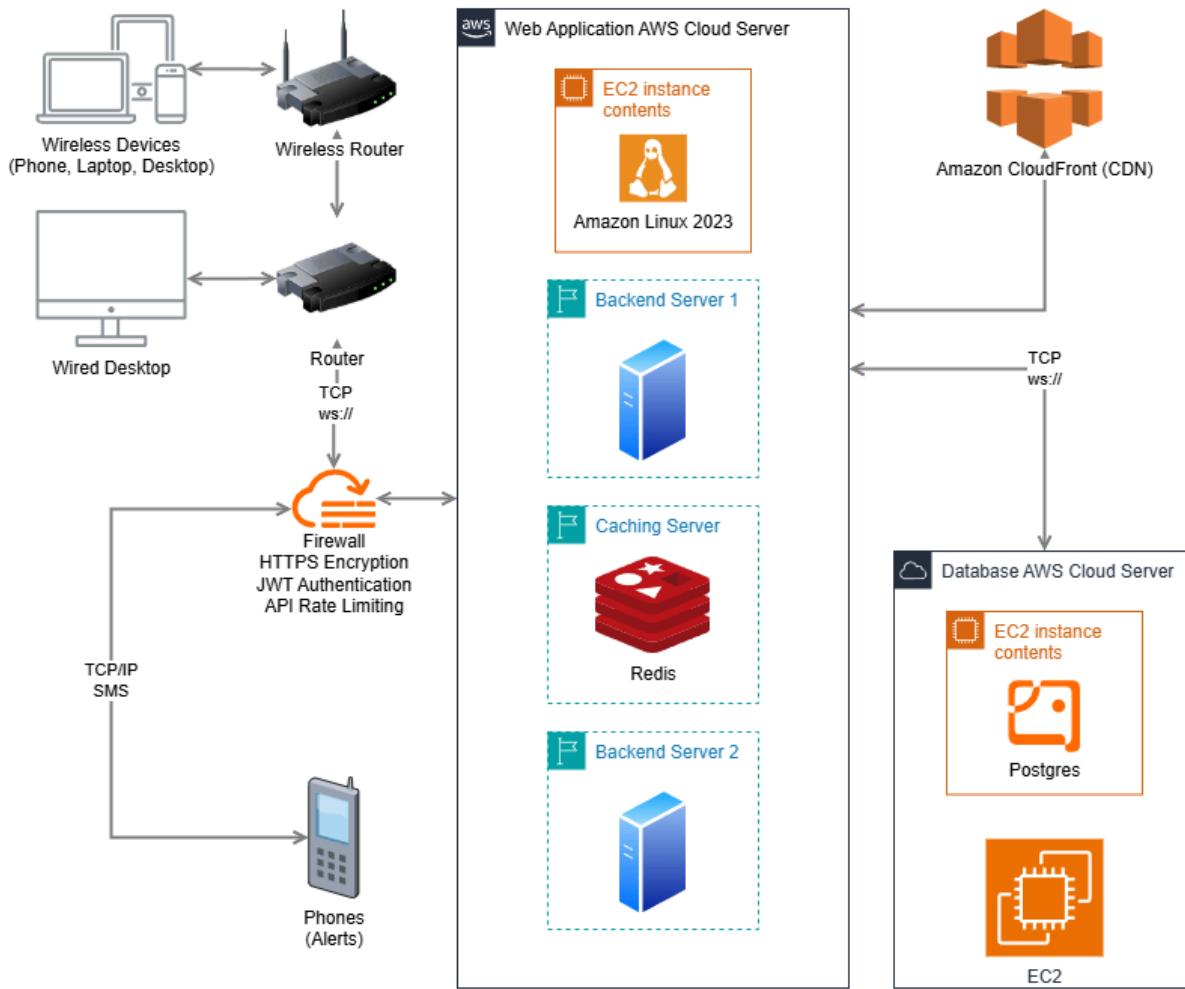


High-Level Application Network Protocols and Deployment Design

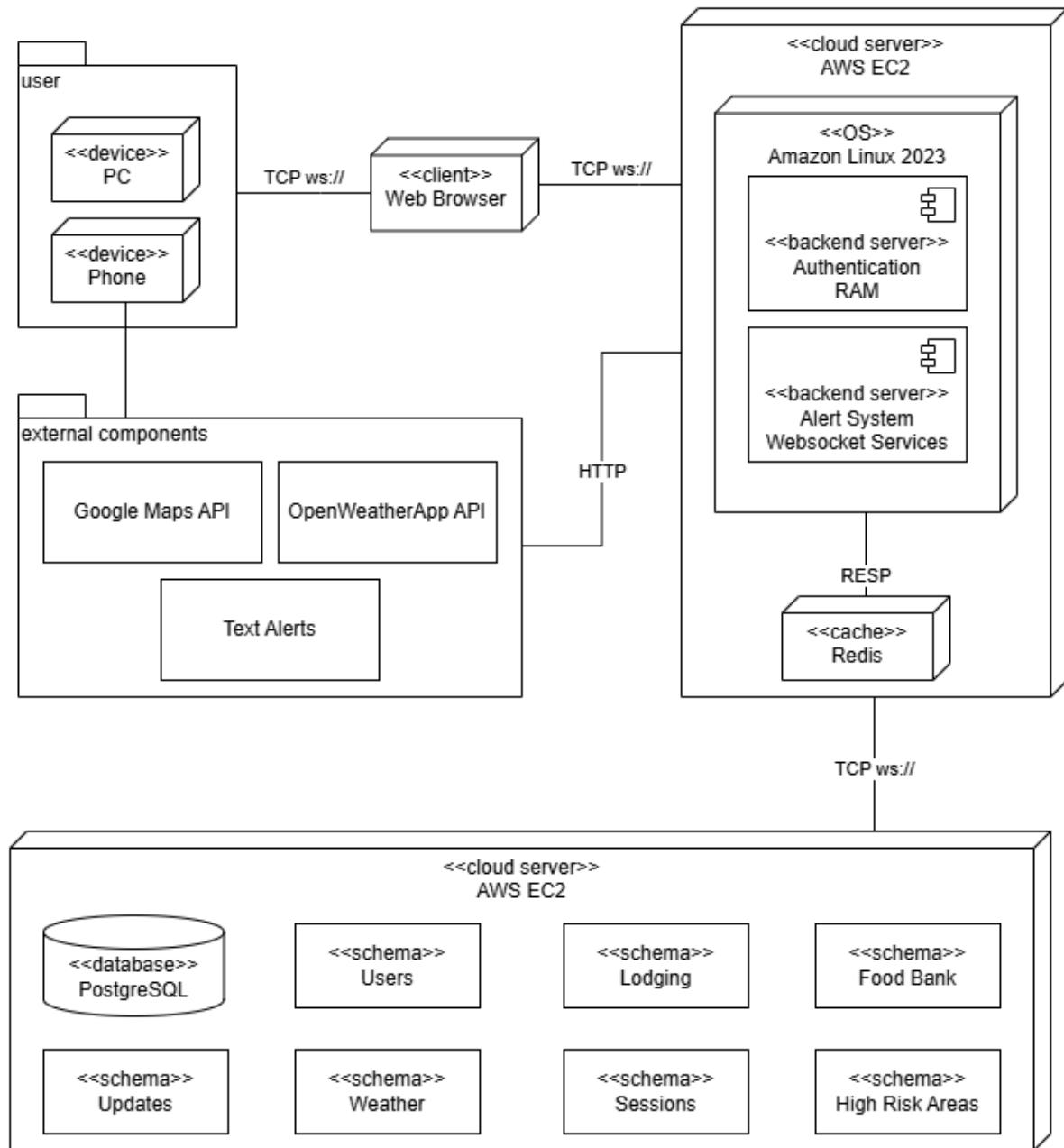
Network and Deployment Diagrams



Application Networks Diagram



Deployment Diagram



High-Level APIs and Main Algorithms

High-Level APIs

The Crisis Relief System exposes a set of RESTful APIs and WebSocket endpoints that support user authentication, resource management, emergency alerts, real-time notifications, and external API integrations. These APIs are designed to ensure scalability, security, and efficiency, following best practices such as rate limiting, caching, pagination, and event-driven messaging (Kafka Queue).

1. Authentication APIs (AuthService)

These APIs handle user login, registration, and session management with JWT authentication for secure access.

- POST /auth/login – Authenticates users and returns a JWT token.
- POST /auth/register – Registers a new user in the system.
- GET /auth/verifyToken – Validates the user's JWT token for authentication.

2. Resource Management APIs (ResourceService)

These APIs allow users to search, add, update, and delete crisis relief resources like shelters, food banks, and hospitals.

- GET /resources – Retrieves available shelters, food banks, and hospitals.
- GET /resources/{id} – Fetches details of a specific resource by ID.
- POST /resources – Creates a new shelter or resource entry.
- PUT /resources/{id} – Updates details of an existing resource.
- DELETE /resources/{id} – Removes a resource from the system.

Additional Features for Optimization:

- GET /resources?type=shelter&location=SanJose – Filters shelters in a specific city.
- GET /resources?availability=true – Returns only available shelters.
- GET /resources?page=1&limit=10 – Implements pagination for better performance.

3. Emergency Alert APIs (AlertService)

These APIs manage emergency alerts, ensuring users receive real-time notifications about crises.

- POST /alerts – Creates a new emergency alert in the system.
- GET /alerts – Retrieves all active emergency alerts.
- GET /alerts/{id} – Fetches a specific alert by ID.
- POST /alerts/{id}/notify – Sends an emergency notification to users via SMS and email.

4. Real-Time Communication APIs (WebSocketService)

WebSockets enable instant, real-time updates on shelter availability and emergency alerts.

- WebSocket Endpoint: ws://alerts – Establishes a WebSocket connection for real-time updates.
- sendUpdate(data) – Pushes live alerts to all connected users.
- listenForChanges() – Listens for updates from the backend and delivers instant notifications to users.

5. Event-Driven Messaging APIs (Kafka Queue)

The system uses Kafka Queue to process real-time events and ensure scalability in delivering notifications.

- publishAlert(alertData) – Sends a new emergency event to Kafka for processing.
- consumeAlerts() – Listens for new alert events and triggers notification broadcasts.

6. External API Integrations

The Crisis Relief System integrates third-party APIs to enhance functionality and provide users with accurate location and weather data.

- Google Maps API (GET /maps/geolocation) – Fetches geolocation data for nearby shelters.
- OpenWeatherMap API (GET /weather/alerts) – Retrieves weather-related crisis alerts.
- AWS S3 API (POST /s3/upload) – Uploads and stores shelter images and multimedia files.

7. Notification APIs (NotificationSystem)

These APIs send email and SMS notifications to users when an emergency occurs.

- POST /notifications/email – Sends email alerts to users.
- POST /notifications/sms – Sends SMS notifications for emergencies.
- GET /notifications/history – Retrieves past notification logs for audit purposes.

8. Admin & Monitoring APIs (Admin Dashboard)

For system administrators, these APIs allow monitoring, approving, and managing platform data.

- POST /admin/resources/approve/{id} – Approves newly added shelters before listing.
- DELETE /admin/alerts/{id} – Removes an outdated or false emergency alert.
- GET /admin/logs – Retrieves system logs for security and performance monitoring.

9. System Logging & Error Handling APIs

These APIs track API performance, errors, and security events.

- GET /logs/errors – Retrieves a list of API errors and failures.
- GET /logs/usage – Fetches API usage metrics for monitoring and debugging.

10. Performance Optimization Features

To enhance system efficiency, the following optimizations are included:

- Rate Limiting – Prevents excessive API requests per user.
- Caching (Redis Cache) – Stores frequently accessed data for faster retrieval.
- Pagination – Limits large query responses to improve API speed.

Advanced Search

Depending on a user's interest or needs, CrisisRelief will be able to provide catered results that will help a specific user. A search will filter through key terms such as the main groupings of aid while progressively getting more specific with more and more input. For instance, a user can include "Food Bank" and "San Francisco" in their query. As a result, CrisisRelief will read from the Food Bank database for any entries that belong in San Francisco. In addition to user-provided input, CrisisRelief will take advantage of user location and user history when permitted as to avoid irrelevant responses.

Strict filtering may pose a greater obstacle in situations where aid is of need. It will be important for our search to have leniency in the input provided. Spelling errors or generalities should be treated the same as an identical match.

Ranking

A key factor in an aid's convenience is accessibility. If it's inaccessible, it should not be treated with any importance. In terms of ranking, distance will typically serve as a good default for what should be displayed to a user first. Using the Google Maps API alongside stored information on user location will provide such metrics. However, there are other things that are important to also keep note of. High-risk zones or emergencies due to circumstance will be considered thanks to the up-to-date nature.

For instance:

- Food Bank A is a 45-minute walk away but is dealing with flooding
- Food Bank B is an hour's walk away but has no obstruction

Food Bank B will be the one prioritized.

Community input is valued for CrisisRelief, so relevance will alter results based on reviews and reputation. Knowing where to avoid is especially important for things that may be costly or time-consuming.

Key Project Risks

- Skills risks
 - Risk: Some team members are inexperienced in TypeScript, React, or Node.js.
 - How to fix: Everyone is working to make up for what they are inexperienced in, either through watching YouTube videos to help with specific tasks, or asking others that are more well-versed in the subject.
 - Risk: Backend team is newer to MySQL database management.
 - How to fix: The entire backend team is working together to make sure everything is well and helping in spots which the others may not understand.
- Schedule Risks
 - Risk: Database was not set up towards the end of Milestone 1
 - Fix: Francis and Karla were able to work together to set up the database with the slightly extended deadline. Amazing work.
 - Risk: Potential delays in integrating Google Maps API and OpenWeatherMap API.
 - Fix: Assign a dedicated team member to API research and testing early to prevent bottlenecks.
- Technical Risks
 - Risk: Potential server downtime or scalability issues due to high traffic.
 - Deploy on AWS EC2 with auto-scaling, use Docker containers for easy deployment, and implement load balancing

- Teamwork Risks
 - Risks: Poor communication may slow progress, especially across different roles (frontend, backend, database).
 - Fix: We are meeting three times a week (T,Th,Sat) to see how everyone is doing. We also have a notion set up to see how tasks are going along, as well as a team leader that is great at checking in with us.
 - Risk: Differences in coding styles leading to merge conflicts.
 - Fix: Possibly establish a code formatting guideline, such as Prettier for TypeScript, and check in with everyone before merging pull request
- Legal/Contents risks
 - Risk: Licensing issues with third-party APIs (Google Maps, OpenWeatherMap).
 - Fix: Verify API terms of use and use only free-tier options unless necessary to upgrade. Monitor API rate limits to prevent unexpected costs.

Project Management

How we are going to be managing our project is through the use of Notion. Our Notion setup is pretty simple. We have two separate dashboards, one for checkpoint one and one for checkpoint two. Both dashboards include basically the same things. They include the tasks, the description of the task that was given to us on GitHub, who is assigned that task, and when the task should be due. Anyone can move the task to currently in progress or completed. Sadly, our task management wasn't up to par with how we expected this milestone. We shall be using Notion still, but will need to do better to help everyone meet their deadlines, by either checking up on one another more and/or keeping ourselves accountable.

Invitation Link:

<https://www.notion.so/Crisis-Relief-Milestone-3-1a8617e5d24380f09984eb7399cd92ab?pvs=4>

Current Searchable Terms

- **Locations:**

- “shelter”
- “food bank”
- “Main City Shelter”
- “Downtown Emergency Shelter”
- “Suburban Family Shelter”
- “Community Food Bank”
- “Downtown Food Hub”

- **Reviews:**

- “helpful”
- “excellent”
- “clean and well-organized”
- “nutritious options”
- “safe haven”

- **Search History:**

- “food bank services”
- “emergency shelter”
- “downtown shelter”

List of Team Contributions (Team Lead Only):

Team Evaluation Feedback

I am pleased to share that we were able to achieve the milestone.

Geoart Corral (10/10): Geoart was an excellent team member. His prompt responses and commitment to the project were greatly appreciated. He put a lot of effort into the search algorithm and also improved checkpoint 1 documentation.

Ayesha Irum (10/10): Ayesha put in a lot of effort to complete the diagrams for checkpoint 1 and remained in contact with the team. Her contribution in team discussions and on the rating and ranking sections was really helpful.

Kyle Nguyen (10/10): Kyle coordinated our documents and collaborated well with Geoart with respect to the Search Bar UI. His documentation was detailed and focused, and this ensured our project documents were organized.

Karla Cardenas Andrade (8/10): Karla was excellent in the storyboard. At times, however, her slow responses on Discord created additional work for other team members. Addressing this communication issue would allow everyone to work together more effectively in the future.

Francis Aviles (9/10): Francis assisted greatly with the database and ensured everything was properly configured. Although he performed well with the technical aspect, he did not meet the team's timelines, which put the entire project behind schedule. It would greatly benefit him if he could enhance his time management and discuss the schedule expectations.

Background Reading

Class Notes - Geoart Corral

Continued on next page...

Week 4

MVP: Minimum Viable Product

Last Meeting for V2

Copy V2, not V1

Human Interaction, Network, Database, GIG?

Network Security
Cyber Security → Spionage In & Outing
Black Boxes

M2

- 3) Improve the dev workflow
- 4) Prioritize High-Level Backend Requirements
- Priority 3 esp. Payment System

+

Prioritize Cm:

- 1. User

1.1 ...

1.2 ...

2. Pay User

2.1 ...

2.2 ...

Priority Two

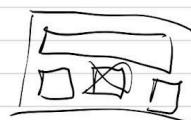
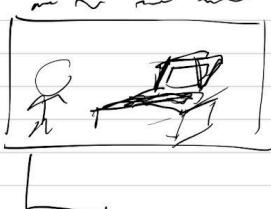
5) Mockups / Storyboards

Mockup for all use cases

→ Needs to be done by hand

Teams need to be aware of each other

Mockup: ↑→ Drawing



wireframe (not to often mocking)

6.) High-Level System Design

TCP = Reliable

• Connections establish a path from c. transmission

• Streaming services (Netflix, YouTube)

UDP = Lossy & reliable = no transmission; Error
Protocol, fast

6.2) Backend Architecture

Cloud, Containers, etc.

CML Class Diagram

• COTP or PCD (Protocol Control Programming)

6.1) Databases

C.3) High Level Application Network Protocols and Deployment Design

• Not required to implement new protocols but recommended

• APIs, especially when can do it

C.4) High level APIs and Meta Languages

• What APIs to use

• Deal with about Post, Get, etc.; use plain english

7) Cloudsys

!

8) Project Management

Chapter #2

Vertical Partition; must open for rest of project

!

VP: Commitment

Must validate everywhere

VP: Algorithms

Search Fundamentally, rest general for UI

Planning and Planning

Optimization

Fault Tolerance

* Prod of inserting into database! Create an account

* Can pull data from database! Search Bar

* Test Algorithms

 ↳ If not found, suggest a recommendation

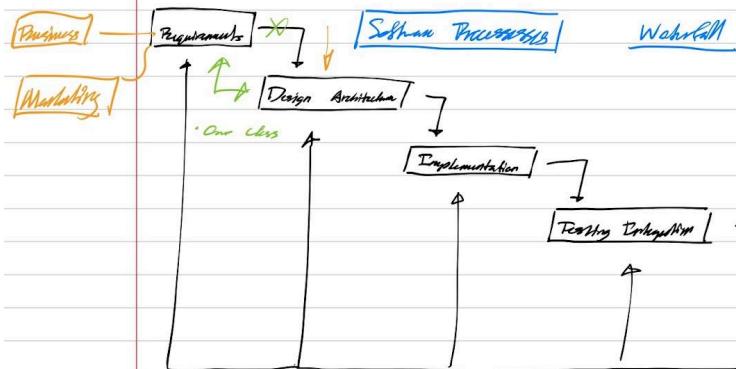
* No class Mar 13

* Next week: CI/CD = Continuous Integration

- Workflow Actions

Only fix M1, don't add

No carrying mistakes into other milestones



Cannot wear ballerinas

• Requirements => Design Arch.
Not for this class

• Everything fixed in uptake

- Why can't you go back?

↳ You're working with other teams

↳ They all agree first

↳ Marketing makes social media post, can't drop everything

* Discipline

Initial History

• Lisa OS + Macintosh

↳ Used this model

• User gave feedback now

• Windows 93-95, they didn't user user feedback; took 7 YEARS

↳ Needed faster turnaround

• Startups use "Waterfall" to ensure they can please investors

• Poly competition was a motiv

↓

~Why no Usability?

↳ Didn't think about Usability until 1997

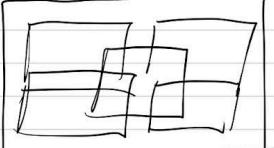
↓

Final Exam
Question

• Maintenance lasts the longest (forever)

• Most controversial and gives most trouble? Implementation

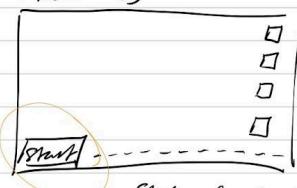
UX (OSX New)



• Windows everywhere

• Hard to manage

Windows 95



• Start of widespread usability

* Usability is important

• Syncronous; Not User

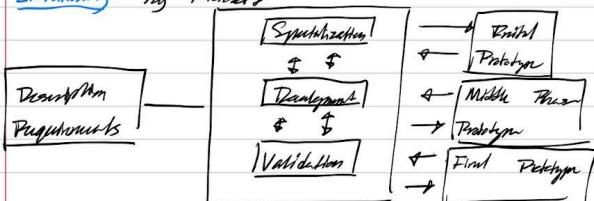
Disadvantages

• Cost increase exponentially

↳ Prototypes take a lot of time

• Create a lot of spaghetti code

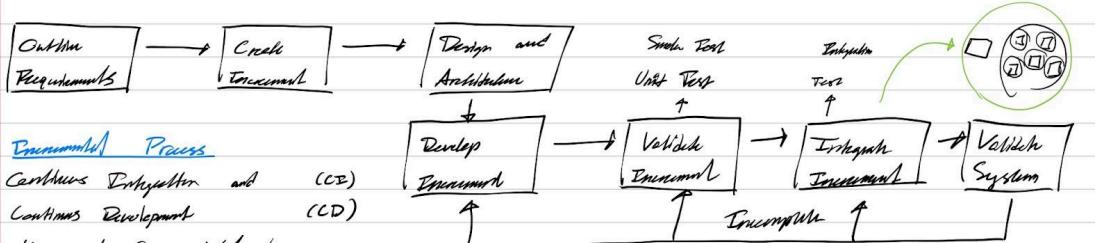
Evolutionary vs Waterfall



~What would a middle sized company use?

↳ Both!

• CI/CD = Continuous Integration / Continuous Development



Very good for global teams

- Always have to test

* Important for career

- All components are decoupled

Disadvantages

- Many validate everything at the end

Advantages

- Used by today's industry

* Doesn't merge the team Process is good for product

- No prototypes

Best?

Integrated With CI/CD

Extreme Programming (XP)

User Center Design (UCD)

Agile

+ code review

+ Pair Programming

+ Walks while code; suggests changes when discussing

+ CD/CI + Sprints = Checkpoints

+ Scrum: Team lead brings back and asks questions about everything

+ Dependencies: Individual deadlines from team lead

Group Work vs Team Work

Group Work = Ideas + Individual

Team Work = Constant communication and synchronization

CONGRATS TEAM! we won boot MI!

Lesson Again

- Supply older versions for non-functional requirements

- Configuration analysis = Include the unique features based on what was approved

- Take the user seriously

- No AI ...

- ⚡ Copy and pasting

- ⚡ Use for productivity

- Team leads Guide and check for high quality

Designs

• How many devices can we support?

↳ Sparsity of public devices

↳ 100' → Can do it because we like

• Port to port? What protocol?

DNS

Interacts with the cloud servers

For now, imagine just one

↳ port@server.edu

↳ Domain

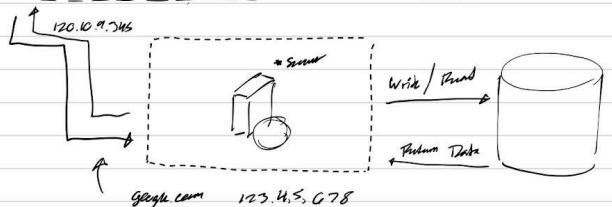
Map from an IP Address

↳ Closely coupled

• DNS = Hash table of IP Address (key) and Domain (value)

↳ Can have many domains

• Need cache, otherwise expensive

3 - DatabaseRelational

• Store and persist with stored

• Good for batch

• All or nothing → Decent performance

• Hard to have anything on writing

• Databases divided upon context

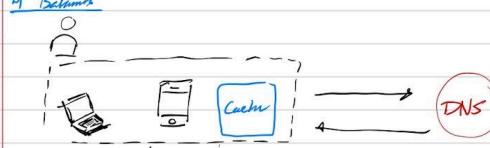
Non-relational (NoSQL)

• Low latency, very fast!

• Unstructured data

• Most吐吐量 (latency not strict)

• Meaning limits

4 - Balancer

• Works like a VPN

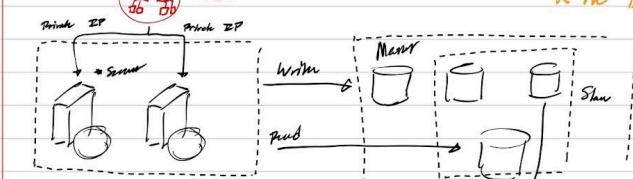
• Very important

• What if a server was almost overloaded

• Automatically create virtual instances

• Applications like "Prophet" use auto failover on balancers

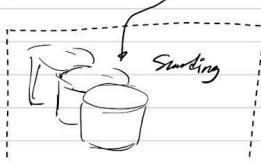
*** NO BALANCERS CAUSE IT'S EXPENSIVE**

Master/Slave Pattern

Master = Write

Slave = Many read

(?)
Slaving = technique to reduce delay

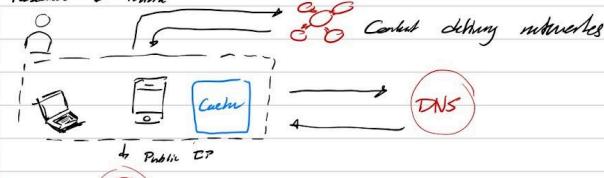


Does it make sense to put a cache at server?

Yes! Cache is good for data; ads too

What's wrong with lots of caches

Process I think



Private IP

Balancer

Private IP

Private IP

Server

Prod

Writ

Mem

Prod

Week 7 - System Design Async Lecture Part 2

3/13/25

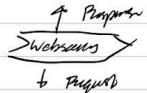
- Start with mapping out entities
 - Everything is important now

⚠️ Previous slides / PDR for diagrams

Monolithic Architecture ~ Small Scale 0-100 users

[~19:40]

- One thing wrong? Shallow thinking fails
- Database contains user media files
 - S3 Bucket Database
 - Most everything about user is monolithic
 - vehicles for messages
 - DB has IP access to media files



Tech Stack Pros [~38:40]

Frontend: React

Backend: Fast API with python, DB with python

- Asynchronous calls

1

DD [~39:50]

- No SQL good for huge
- Can you store all entities? Yes → Fast transactions? No → Store lots of data? Yes → Sharded data? No
 - SQL databases!
- The rule of scalability
- Monolithic fears SQL database
- PostgreSQL can handle many requests

NoSQL

Conceptual Design of the database

[~50:00]

- Data class review (relation, strong / weak)
- Encryption and securing = non-functional for security and auth

1

Entity Relationship Diagram (ERD)

[~1:04:00]

- More in MS
- Associative Entity = relationship that becomes an entity
- Primary keys can't have dashes
- Attributes have no cardinality
- ISA = Can be one

Encryption + Networks

[~1:07:20]

Be sure to return the provided diagrams

Application layer → Firewall → Session → Matching systems

↳ Secure Network Applications

↳ HTTP, HTTPS, FTP, ...

Client side: Encrypts when sending, decrypts when receiving

TCP protocol doesn't lose information

UDP doesn't maintain a connection, it just sends it (real time)

Modern apps use both ↗

Data can be in charge of reader; protocol chosen by raw msg

↳ Packet drop

↳ Forwarding protocol = send packet thus close connection

Link or Deck Layer * Point-to-point protocol

↳ Local networks and internets

↳ Uses frames in the header

Physical layer

↳ Bits to the wire

Protocol don't use TCP and UDP because of security breaches

Conceptually, a monolithic layer

10-100 Users - Common [~1:53:20]

Handled in parallel; synchronous

↳ Batch mode will happen when waiting for things to happen

Challenges: Message delays, latency, bottlenecking, DB gets overloaded, WebSockets consume memory, monolithic = no offload messages
... so when load big, nothing to offload

Improvements: 1) Bulk service 2) Many stores (WebSockets and chat rooms) 3) Apart from SS, inform Central delivery networks
4) Forward for routeless (move away from ECR to long Nests)

Optimize DB with Replication with Master-Slave technology

More repeat messages you need < cache, like Redis

Distribute websockets and won't load bottleneck

↳ Spreading to other websockets example

Message queue stores messages offload as improve performance

[~2:16:00] - Tech for this example

1K-10K Users [~2:22:00]

Challenges: 1) Full Scale = Expensive! 2) Support millions of messages 3) WebSockets will be slow 4) Travelling message is hard
5) Encryption adds processing overhead 6) Media traffic increases bandwidth costs

Strategies: 1) Decentralize Sharding 2) Event-Driven Architecture (Process message queue, Kafka) 3) Temporal buffering (Redis)
4) Improve message selective via distribution 5) Temporal buffering with more caching

Week 8: Zookeeper, MySQL, and Redis

Q&A Session

- 1) Key advantages of replication?
 - a) Distributes load across multiple servers
 - b) Redundant storage for data
- 2) Optimize database between 1K-10K users?
 - a) Master-slave replication
 - b) Partition messages \Rightarrow turns async to synchronous
- 3) Why Kafka and Pub/Sub/MQ density 1K-10K users?
 - a) Partition messages \Rightarrow turns sync to asynchronous
- 4) CDN
 - a) Reduce latency and improve delivery
- 5) Why move from distributed?
 - a) Load and scalability

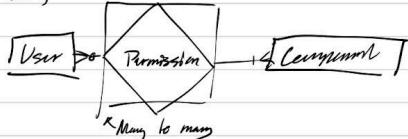
Milestone 3

- M2: Partition users and anything in the database
- Clustering 2 = Only partition 1! with readability
- Commands must not self-explainable

Relationships in DB (internal)

- Auto ID = auto-increments with secondary stuff and stores a token in the machine (don't have to implement)
- Roles: User can own permissions

(C-10 rows)

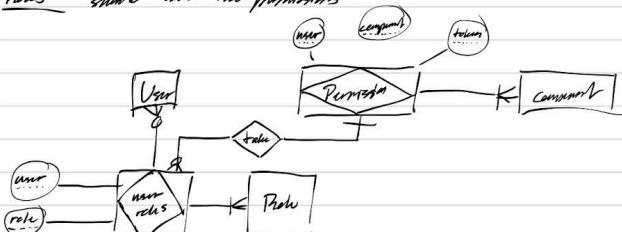


User		Permission				the component	
id	name	id	pid	uid	stun	cid	desc
1	Jess	1	1	2	~	image	
2	Chia	2	1	2	~	video	
3	Bob	3	2	1	~	calls	

Not good for big system

12 \rightarrow Normal \rightarrow Share

- Becomes huge if run with 10
- Roles should have their permissions



We could do this if you want

Normalization Required for this class

Normalization 2NF

- Division redundancy (related to good scalability)
- Increased integrity
- Sometimes decreases the performance of the database
- Normalization & Optimization in order to succeed

1NF (First Normal Form)

- All the values in the same column are atomic

- Only has 1 place of data with a unique identifier

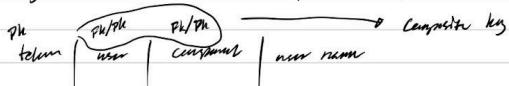
- No repeated attributes in the same group
- All tables must have a PK (primary key)
- Same data = same database

User X
 all | Each name Full name is not atomic

1

2NF

- In 1NF
- Non-key attributes can't have partial dependencies



- Partial means its only valid on part of the composite key

Order				+ ✓
✓ PK orderid	PK product	FK customer	name supplier	No composite
✓ PK	PK/FK	FK		✗
✗ PK	PK/FK	PK/PK		✗
✗			"quantity"	✗

1

3NF

- The non-key attributes must not have transitive dependencies

↳ A → B
 B → C

Assume the table "department" exists

✗ Department name → id

Department name → id

↳ Only happens when multiple tables

1

4NF

Student

id	language	country of residence
1	english	USA
2	spanish	Spain
3	English	Spain
4	Spanish	USA

↳ Arnold didn't write multiple values

Student language

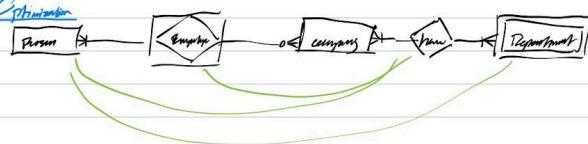
student residence

id | language

id | residence

1

Optimization



· If company has only 1 department, just one can know if a person works at a department

· Create least amount of tables as possible

Milestone 1 Version 2

Executive Summary

Disasters and emergency situations cause distress as people are displaced from their homes, in need of shelter, food, and medical attention. Unfortunately, much crisis relief comes from outdated registries that have one-off guesses of what's needed and/or available. People cannot easily get what they need when they need it because there are no up-to-date sources of what's being offered and where, until now, with CrisisRelief. CrisisRelief seeks to serve as a portal for everything one needs to find temporary shelter, food banks, medical help, and natural disaster assistance, all in one place at the same time with real-time information. CrisisRelief fulfills the need for access in a timely fashion through utilizing APIs and hopes to include crowd sourced information in the future.

CrisisRelief utilizes the Google Maps API for geolocation, mapping, and emergency routing, to direct users to available resources. In addition, it also uses OpenWeatherMap API, for weather reporting and notifications that can warn users of bad weather that would hinder access to certain resources. What makes CrisisRelief unique is its live resource location and crisis direction. CrisisRelief has an ease-of-access interface for its web version so that those in distress don't have to parse through technology to receive help sooner and better.

Funding this project will enable the development for scalable, cloud-based infrastructure that ensures high availability and responsiveness in areas most needed. CrisisRelief also wants to enable community updates, allowing users and relief workers to report real time changes in things such as shelter capacity and food availability. CrisisRelief is set to become the default and only application required for any users in distress to find the help they need. Investing in CrisisRelief means investing in a smarter and more efficient way of providing aid to people in need of assistance.

Use Cases

Use Case 1: Finding Nearby Emergency Resources

Actors: John(Customer), CrisisRelief(My Company)

Assumptions:

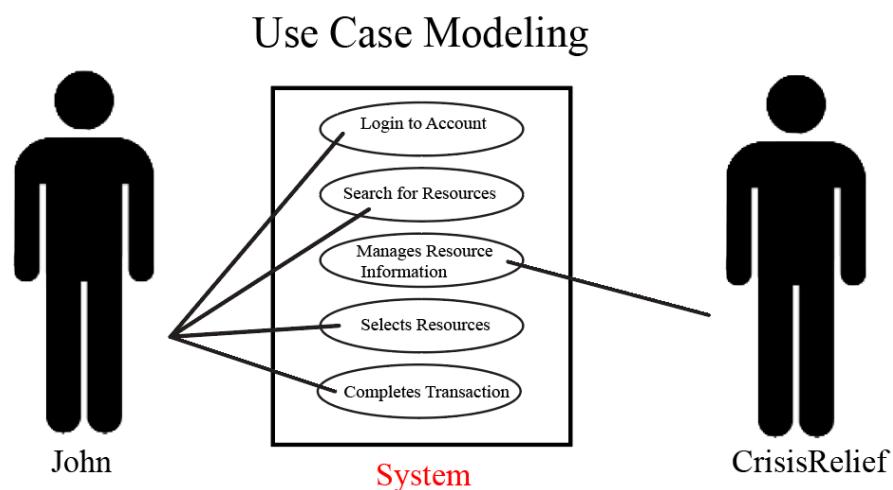
- John has internet access.
- John is in a stressful situation and needs quick help

Use Case:

John, who was affected by the first in LA, is looking for the nearest emergency shelter after his house has burned down. John decides to access CrisisRelief which helps display to him an interactive map of shelters, foodbanks, and medical centers that are nearby to him. After John selects a location, CrisisRelief will navigate John to that location in the quickest and safest way possible.

Benefits:

- Enables John to quickly locate emergency resources
- Provides clear navigation
- Gives real-time accessibility, helping to reduce anxiety.



Use Case 2: Real Time Updates

Actors: Mark (Relief Worker), General Public , CrisisRelief(My company)

Assumptions:

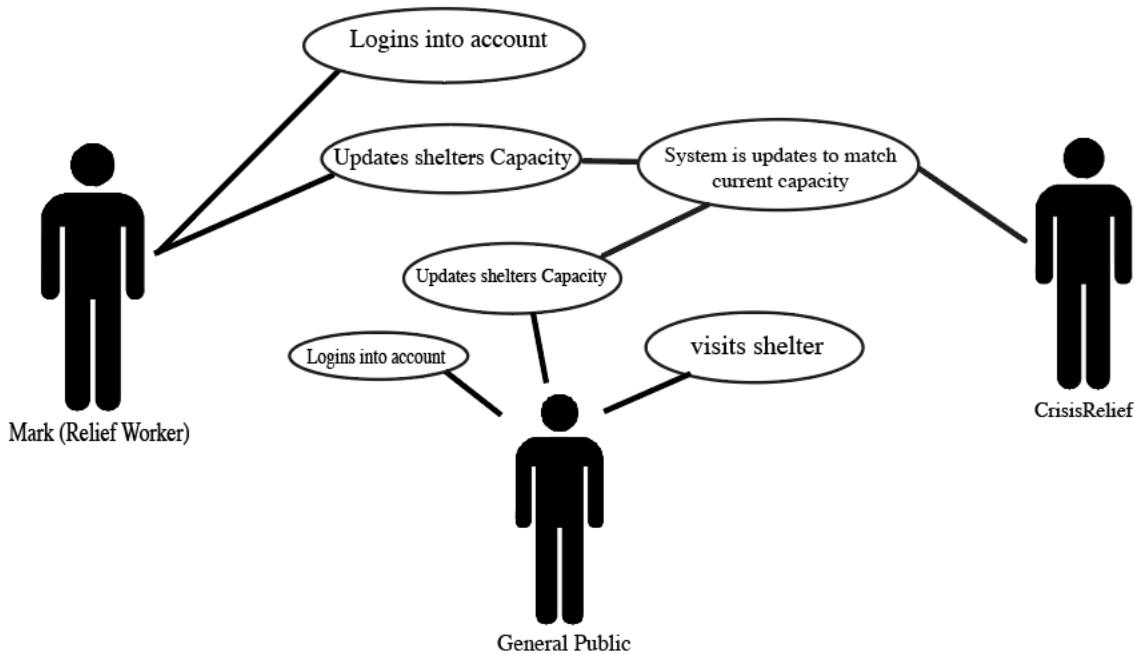
- Mark administrative access to update resource information
- Shelters and resource centers have internet access.

Use Case:

Mark, who is a relief worker at a local shelter, sees that the shelter capacity is almost at max. He goes in and logs into the system(CrisisRelief), and updates the capacity available from 60 down to 10. This real time update helps prevent miscommunication from word of mouth and also helps other people in need find available shelters. Mark also decides to mark that there is a water bottle shortage, which can prompt nearby relief locations to restock on supplies.

Benefits:

- Keeps emergency resource information accurate and up to date.
- Helps communication between shelters and the general public.



Use Case 3: Shelter Locator

Actors: James (Customer) CrisisRelief (My Company)

Assumptions:

- James is houseless and currently does not have shelter
- Concerned about incoming weather emergency
- James does not have stable living condition

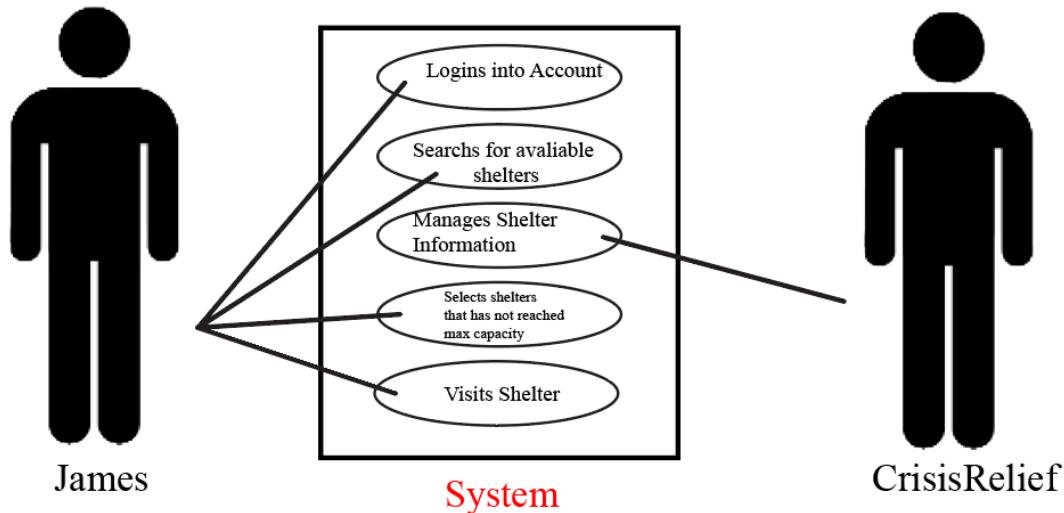
Use Case:

James has currently been evicted from his apartment and is now houseless. Due to cold winters in San Francisco, James wants a secure place to sleep so he logs onto CrisisRelief, which helps him locate nearby shelters with available space for the night. Once James arrives, he is able to find an open bed with blankets and secures his place for the night. James can now sleep in an available bed with blankets and update the website on availability.

Benefits:

- Access to immediate shelter and provide emotional relief
- James is now safe and reduces possible medical risks from not being in the storm.
- A sense of security from harsh weather conditions

Use Case Modeling



Use Case 4: Medical Assistance

Actors: Lisa (An individual struggling with Diabetes) CrisisRelief (My Company)

Assumptions:

- Lisa has been diagnosed but does not have the finances to afford insulin
- Lacks a stable job and is struggling to find ways to pay for insulin and supplies
- Lisa has access to a mobile device and internet

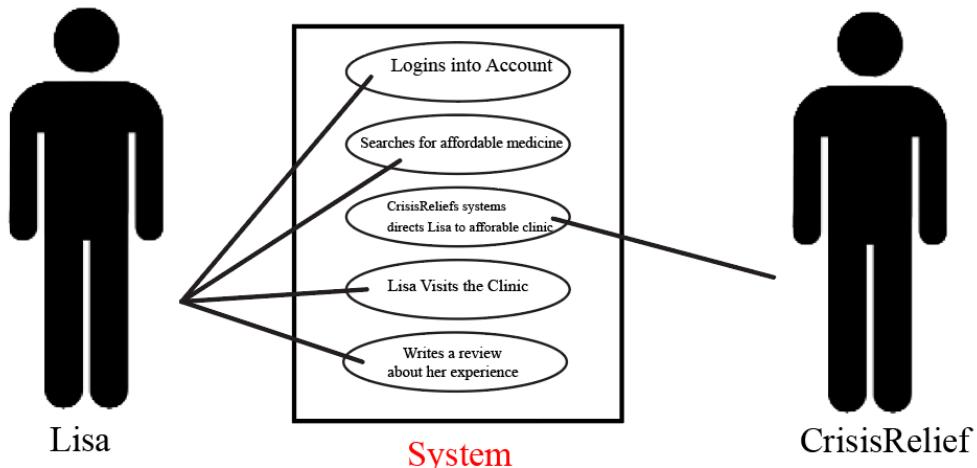
Use Case:

Lisa, a 25-year-old struggling to manage her diabetes, often finds herself unable to afford insulin. Lately, she has noticed that buying one bottle of insulin requires her to compromise a week's worth of groceries. Lisa uses her smartphone and CrisisRelief, and is directed by the server side of CrisisRelief's system to a clinic that provides insulin at an affordable price. She goes to the location and buys the medicine she requires and submits a review about her experience at the clinic.

Benefits:

- Access to free medical care and immediate medical relief by a professional health provider.
- Gains a long term support system and reduce medical risks

Use Case Modeling



Use Case 5: Real-Time Weather Warnings on Resource Pages

Actors: Kyle (Customer), CrisisRelief(My Company)

Assumptions:

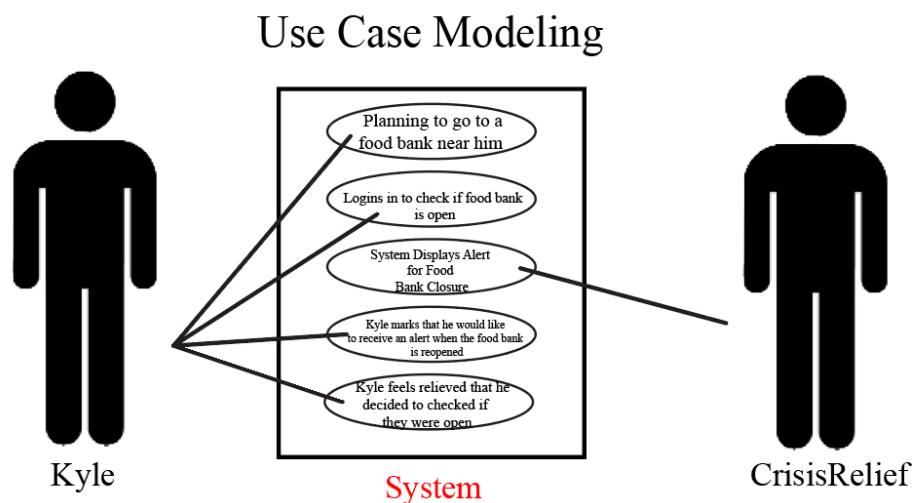
- Kyle has access to internet
- Weather conditions impact shelter accessibility and operations.

Use Case:

Kyle is planning to go to a food bank near him, but after taking a quick glance outside, he realizes that maybe the weather may not permit him to do so. He is concerned that if he was to go to the food bank, maybe it would be closed. Kyle decides to open a crisis relief platform(CrisisRelief), which allows him to search for the status of his food bank. After typing in his food bank, he sees that there is a warning symbol over the location. After clicking on it, Kyle realizes that his food bank is closed due to weather alerts. Kyle decides to mark that he would like to receive an alert when the food bank is reopened. Kyle now feels relieved that he decided to check whether or not the food bank was open, knowing that he would have risked his safety.

Benefits:

- Informs users about weather conditions that impact access to resources.
- Uses CrisisRelief servers directly for real-time weather alerts.
- Prevents unnecessary travel to closed or unsafe locations.



Use Case 6: Identifying High Risk Areas and Safe Zones

Actors: Samantha (Customer), CrisisRelief(My Company)

Assumptions:

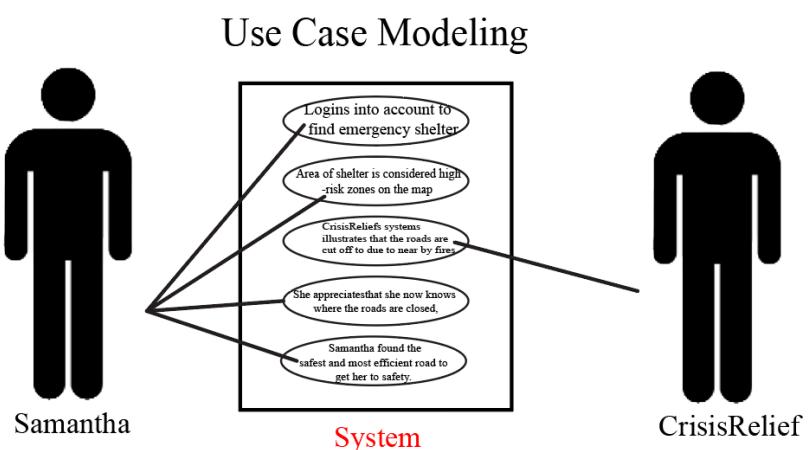
- Samantha has access to a smartphone with internet access
- Roads are closed due to hazards

Use Case:

Samantha needs to reach an emergency shelter, but due to the fires, she doesn't know what area is safe to go through. Samantha is concerned if the emergency shelter she is used to has roads cut off that would hinder her getting there. That is when she decides to use CrisisRelief. CrisisRelief shows Samantha areas that are considered high-risk zones on the map. She appreciates that she now knows where the roads are closed, and which is the safest way to get there. Reassured, she begins to drive, but gets a warning that another hazard is coming up, so she is redirected to a better road to get to her local shelter. By using real time traffic and hazard data, Samantha found the safest and most efficient road to get her to safety.

Benefits:

- Helps users avoid hazardous areas during an emergency.
- Provides real time updates on road closures and risks.
- Offers safer alternative routes that avoid hazards



Use Case 7: Mental Health Support Review

Actors: Jennie (Customer), CrisisRelief(My Company)

Assumptions:

- Jennie has access to a smartphone or to the internet.
- Jennie feels overwhelmed and does not know where to seek help.
- Has no support system to turn to in a time of need.

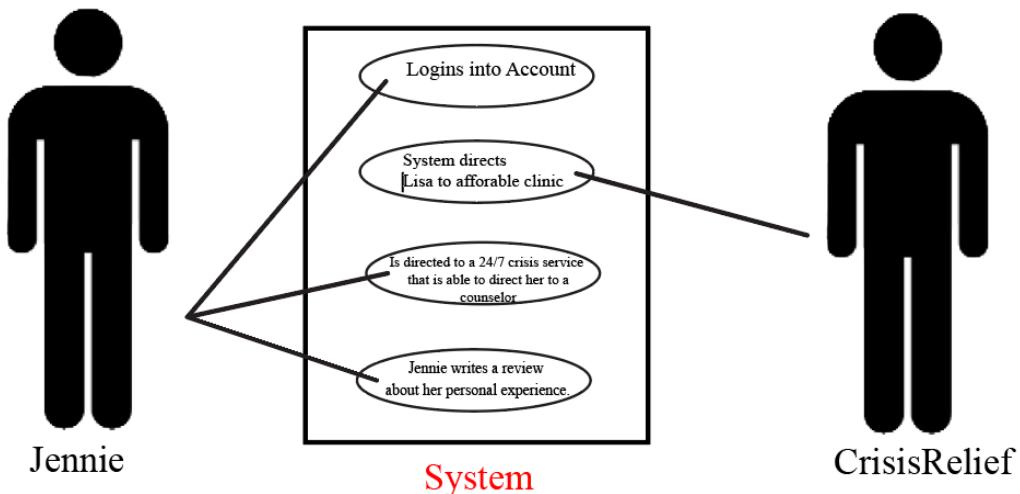
Use Case:

Jennie has just been notified that she will be evicted from her current apartment by the end of week if she is unable to pay rent by the end of the week. Jennie is feeling stressed and anxious about the situation as she does not know if her upcoming pay will be enough to cover the cost of rent. She has not been able to sleep for the past few days and is really affecting her work abilities. Jennie searches on CrisisRelief and is directed to a 24/7 crisis service that is able to direct her to a counselor that provides Jennie the space to talk about her situation. Jennie is able to address her concerns and now has access to a counselor to provide her emotional relief. Jennie writes a review about her personal experience.

Benefits:

- Provides emotional support and creates a long term support system
- Free access to medical help and reduces future distress

Use Case Modeling



Use Case 8: Food Bank Real-Time Update

Actors: Olivia (Customer), CrisisRelief(My Company),and James (food bank coordinator)

Assumptions:

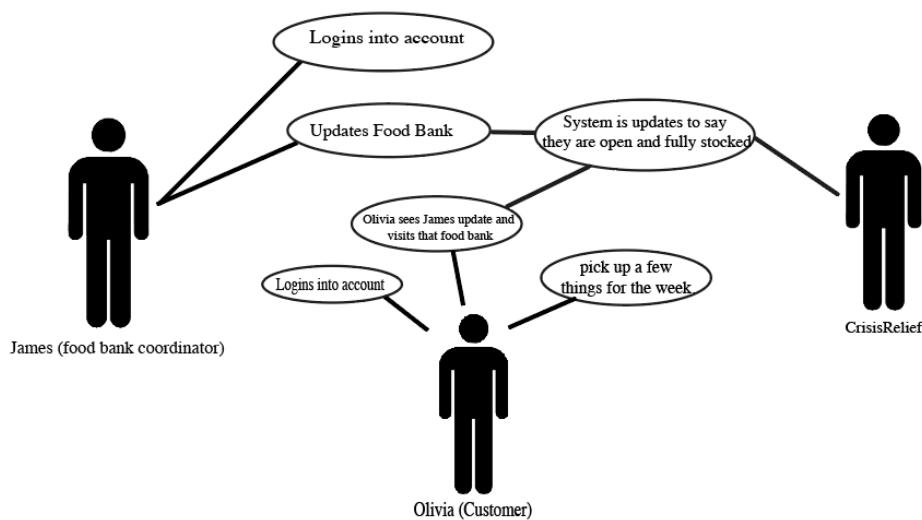
- Olivia had access to internet
- James is able to monitor the inventory in real time

Use Case:

Olivia is currently struggling to find a way to buy groceries for the upcoming week. She wants to visit a food bank to see if she is able to take any groceries home. She goes online and uses CrisisRelief to see if there are any food banks available near her that are open. James is currently working at the food bank and updates the website to state that not only are they open but full stocked as well. Olivia sees James update and is able to visit that food bank and pick up a few things for the week.

Benefits:

- Reduce food waste and people are able to get resources they need
- Real time tracking improves efficiency and allows more people to access resources faster



List of Main Data Items and Entities

1. Users

Description: Individuals who interact with the CrisisRelief platform.

Types of Users:

- **General Public:** Users in need of emergency assistance, food, medical help.
- **Relief Workers:** Verified personnel responsible for updating resource availability.
- **System Administrators:** Individuals with full access to monitor and manage the platform.

2. Emergency Resources

Description: Essential resources available for individuals affected by a crisis.

Types of Resources:

- **Shelters:** Locations providing temporary housing.
- **Food Banks:** Centers distributing free food to those in need.
- **Medical Facilities:** Clinics and hospitals offering medical aid.
- **Mental Health Support Centers:** Places providing psychological assistance.
- **Supply Stations:** Centers distributing emergency items (e.g., water, blankets).

3. Weather Alerts

Description: Real-time weather notifications affecting emergency resources.

Types of Alerts:

- **Severe Storms**
- **Hurricanes**
- **Flood Warnings**
- **Heatwaves**
- **Wildfires**

Functional Requirements

1. Functional Requirements for Resources

- 1.1. The system shall allow users to search for nearby emergency shelters.
- 1.2. The system shall display real-time availability of emergency shelters to users.
- 1.3. The system shall provide directions to the nearest emergency shelters for users.
- 1.4. The system shall notify users of real-time updates on shelter capacity.
- 1.5. The system shall show estimated travel times to shelters for users.
- 1.6. The system shall enable users to search for nearby food banks.
- 1.7. The system shall display real-time availability of food banks to users.
- 1.8. The system shall provide directions to the nearest food banks for users.
- 1.9. The system shall notify users of real-time updates on food bank inventory.
- 1.10. The system shall notify users of real-time updates on food bank restocking.
- 1.11. The system shall allow users to search for nearby medical centers.
- 1.12. The system shall display real-time availability of medical centers to users.
- 1.13. The system shall provide directions to the nearest medical centers for users.
- 1.14. The system shall notify users of real-time updates on medical center capacity.
- 1.15. The system shall show estimated travel times to medical centers for users.
- 1.16. The system shall provide access to mental health support services for users.
- 1.17. The system shall display high-risk areas on the map for users.
- 1.18. The system shall suggest alternative safe zones to users.
- 1.19. The system shall allow relief workers to update the capacity of emergency shelters.
- 1.20. The system shall allow relief workers to update the inventory of food banks.
- 1.21. The system shall enable relief workers to mark shortages of supplies.
- 1.22. The system shall allow relief workers to update the availability of medical centers.
- 1.23. The system shall enable relief workers to update the status of high-risk areas.
- 1.24. The system shall allow relief workers to update the status of alternative safe zones.

2. Functional Requirements for Notifications & Alerts

- 2.1. The system shall alert users with real-time weather updates.
- 2.2. The system shall notify users of real-time updates on shelter capacity.
- 2.3. The system shall notify users of real-time updates on food bank inventory.
- 2.4. The system shall notify users of real-time updates on food bank restocking.
- 2.5. The system shall notify users of real-time updates on medical center capacity.
- 2.6. The system shall notify users of critical updates on resource availability and conditions.
- 2.7. The system shall allow users to set alerts for weather condition improvements.
- 2.8. The system shall notify relief workers when users access their updates.
- 2.9. The system shall allow relief workers to set up automated notifications for resource updates.
- 2.10. The system shall enable system administrators to configure notification settings for users.

3. Functional Requirements for User Features

- 3.1. The system shall allow users to view historical data on resource availability.
- 3.2. The system shall provide users with the ability to save favorite locations.
- 3.3. The system shall enable users to receive notifications on new shelters or food banks in their area.
- 3.4. The system shall allow users to view user reviews and ratings of shelters and food banks.
- 3.5. The system shall provide users with the ability to filter search results by resource type (e.g., shelter, food bank, medical center).
- 3.6. The system shall allow users to customize notification preferences.
- 3.7. The system shall provide a feedback mechanism for users to report issues or suggest improvements.
- 3.8. The system shall allow users to view detailed information about each resource (e.g., address, contact information, operating hours).
- 3.9. The system shall enable users to share resource information via social media or email.

4. Functional Requirements for User Experience & Interaction

- 4.1. The system shall provide a search history feature for users.
- 4.2. The system shall allow users to view user reviews and ratings of shelters and food banks.
- 4.3. The system shall allow relief workers to view historical data on resource usage.
- 4.4. The system shall enable relief workers to generate reports on resource availability and usage.
- 4.5. The system shall allow system administrators to generate reports on system usage.
- 4.6. The system shall enable system administrators to manage database backups.
- 4.7. The system shall allow system administrators to monitor system performance

5. User Authentication & Role Management

- 5.1. The system shall allow relief workers to log in.
- 5.2. The system shall allow system administrators to manage user accounts.
- 5.3. The system shall enable system administrators to configure user roles and permissions.
- 5.4. The system shall allow relief workers to manage user contributions and reports.
- 5.5. The system shall allow system administrators to manage user contributions and reports.

6. Functional Requirements for Platform and Accessibility

- 6.1. The system shall provide multilingual support for relief workers.
- 6.2. The system shall allow relief workers to access the platform via web browsers and mobile applications.
- 6.3. The system shall provide accessibility features for users with disabilities.
- 6.4. The system shall enable system administrators to manage system security.
- 6.5. The system shall allow system administrators to update system settings.
- 6.6. The system shall enable system administrators to manage API integrations.
- 6.7. The system shall allow system administrators to monitor and manage API usage.
- 6.8. The system shall allow system administrators to manage third-party integrations.
- 6.9. The system shall allow system administrators to update the system with new features.
- 6.10. The system shall enable system administrators to manage system maintenance schedules.

Non-Functional Requirements

1. Usability:
 - 1.1. The system shall have a simple and intuitive interface so users can quickly find emergency resources without confusion.
 - 1.2. Users shall be able to easily navigate through the system, even with limited tech skills
 - 1.3. Registered Users with no formal training shall be able to change the status of locations.
 - 1.4. Registered Users with no formal training shall be able to mark shortages.
 - 1.5. Users within poor environments, like tents, shall be able to complete their tasks.
2. System requirements:
 - 2.1. Users shall be able to complete their tasks through their smartphone, laptop, or desktop.
 - 2.2. CrisisRelief shall use Google Maps API to suggest locations of food banks, or emergency shelters.
 - 2.3. CrisisRelief shall use OpenWeatherMap API to gather information about the weather.
3. Performance requirements:
 - 3.1. Users shall be able to access the status of locations within 5 minutes.
 - 3.2. Registered Users shall be able to change the status of locations within 5 minutes.
 - 3.3. Weather information from CrisisRelief shall be in real time.
 - 3.4. Food bank information from CrisisRelief shall be in real time.
4. Storage
 - 4.1. CrisisRelief shall store data with MySQL.
 - 4.2. CrisisRelief servers shall be hosted with Amazon EC2.
 - 4.3. The database shall be relational.
 - 4.4. Datagrips shall be used to update the database.
5. Privacy
 - 5.1. The data of the user shall not be sold.
 - 5.2. The only data that CrisisRelief shall collect from the user is their name, what help they need, and where they are located.
 - 5.3. When a user logs in, they shall receive a session token that lasts for 5 hours.
6. Content
 - 6.1. The information given shall be easily read through text.
 - 6.2. Images of nearby locations shall be shown to the user if available.
 - 6.3. The directions to locations shall be easily readable.
7. Marketing
 - 7.1. CrisisRelief shall easily be found by people looking for CrisisRelief.
 - 7.2. CrisisRelief shall use SEO to make it easier to find on search engines like Google.
 - 7.3. CrisisRelief shall have social media pages to help visibility.

Competitive Analysis

Identify and Compare Features

Feature/ Company	2-1-1 Bay Area	FindHelp.org	San Francisco- Marin Food Bank	SF.gov	Weather.com
Strengths	Privacy, major emphasis on customer service and providing direct help	Very direct, brings information forward immediately, organized	Beautiful design, detailed means for donating and receiving, localization	Informational, official with SF	In-depth information for different needs, nicely customizable
Weaknesses	Menus and information are intimidating at a glance	Menu/search heavy, too broad of results	Location restricted, site heavily caters to donors despite an emphasis on finding food	Awkward navigation, surface level	Inconsistent or hidden feature placement
Pricing	N/A	N/A	Permits one-time and monthly donations	N/A	N/A
Social Media	N/A	Instagram, X, Facebook, Youtube, LinkedIn	On-site blog, Instagram, X, Facebook, YouTube	Facebook, X	Instagram, X, Facebook, Youtube
Onboarding Experience	Direct with phone calls but menu-heavy otherwise	Concise	Informational but requires some digging for services	Concise but harder to navigate	Simple, clear, and smooth

High-Level Comparison

Feature	2-1-1 Bay Area	FindHelp.org	San Francisco-Marin Food Bank	SF.gov	Weather.com	Crisis Relief
User Registration	-	++	+	-	++	++
Food Bank Information	+	+	++	+	-	++
Real-Time Availability at Food Banks	-	-	-	-	-	+
Immediate and Direct Weather Alerts	-	-	-	-	-	+
Specific and Guided Medical Resources	-	-	-	-	-	+

Summary of Advantages and Competitive Edge

Much of what is currently provided on the web in regard to crisis-related services either serves one specific niche or too broadly displays surface-level information sacrificing specifics and convenience. Where CrisisRelief excels and separates itself in this field is underlined with its one-stop-shop aspect refined to be keener on an individual's needs. User registration is typically restricted to a simple email newsletter or a personal database, however, CrisisRelief aims to help individuals quickly through live updates in a way they want to be updated. Rather than periodic site visits, skimming through lists, or cell phone services as seen in its competitors, CrisisRelief's real-time notifications bring help to its users. This user-first focus also opens the door to more active community-driven contributions, especially as a platform so present in one's day-to-day. CrisisRelief doesn't just improve quality of life, it protects it.

Checklist

- The team has found a time slot to meet outside of class.
- GitHub Master has been chosen.
- The team has collectively decided on and agreed to use the listed software tools and deployment server.
- The team is ready to use the chosen front-end and back-end frameworks, and those who need to learn are actively working on it.
- The Team Lead has ensured that all members have read and understand the final M1 before submission.
- GitHub is organized as discussed in class (e.g., master branch, development branch, folder for milestone documents, etc.).

High Level System Architecture and Technology Used

- Server: AWS EC2
- Operating System: Amazon Linux 2023
- Database: PostgreSQL 16
- Backend Language: TypeScript
- Frontend Language: TypeScript

Additional Technologies

- Google Maps API
- OpenWeatherMap API (Weather Alerts)
- Frontend Framework: React
- Backend Framework: Node.js
- IDE: Visual Studio Code
- SSL Certificate: Let's Encrypt (Cert Bot)
- Docker: Docker Container on the EC2 instance
- Database Design Framework: DataGrip 2024.3.4
- Redis
- WebSockets
- DuckDNS

List of Team Contributions:(Team Lead)

Kyle Nguyen (Documentation Lead) - 10/10

- Led the documentation efforts, ensuring the structure and content were well-organized.
- Assigned sections to team members and oversaw the completion of Milestone 1 Documentation.
- Authored the Use Case section, ensuring clarity and completeness.
- Attended all team meetings and actively participated in discussions.
- Incorporated all feedback provided and made necessary corrections to improve the documentation.

Karla Cardenas Andrade (Database Management Lead) - 10/10

- Took charge of database design and management.
- Contributed to use case development and created diagrams that enhanced clarity in documentation.
- Attended every meeting and took suggestions positively, building upon them.
- Provided guidance on database implementation and approved the final database setup.

Geoart Corral (GitHub Master) - 10/10

- Managed GitHub branches, ensuring smooth version control and collaboration.
- Regularly updated the README file and maintained project structure.
- Authored the Competitive Analysis section in the documentation, which was thoroughly detailed and well-researched.

Ayesha Irum (Frontend Lead) - 10/10

- Led the frontend development efforts.
- Completed the Functional Requirements section with precision.
- Designed the UI for the “About Us” pages.
- Proposed the idea to separate the “About Us” page into two:
- One page listing all members.
- A second page with individual team member details.

Francis Aviles (Backend Lead) - 7.5/10

- Led the backend development, focusing on core functionality.
- Authored the Non-Functional Requirements section.
- Attended all team meetings and actively participated in discussions.
- Incorporated all feedback provided and made necessary corrections to improve the documentation.
- Tried to set up the Database but was not able to complete it under the internal team deadline.
- No database was set up. For Milestone 1.