CS4354 - Concepts of Databases Spring 2025: Storm Guard Disaster Relief Coordination System

Group Name	Storm Guardians
Project Title	*Storm Guard Disaster Relief Coordination System*
Project Members with R#	Nivedita Prabhu, R11738979 Ayodeji Joseph Adeogun, R11764742 Nicholas Scott Marshall, R11772596
Due Date	Friday, February 28th, end of the day
Submission	Blackboard
Possible points	50

Section 1: Proposal Details

Project Name: *Storm Guard Disaster Relief Coordination System*
Team Members:

- Nick Marshall: Interface and UI/UX developer
- Ayodeji Adeogun: Researcher and Integration Testing
- Nivedita Prabhu: Database Engineer

Problem Statement: The Hurricane Relief Coordination System addresses the limitations of employing Excel to manage disaster response information. Excel is susceptible to data integrity issues, lacks scalability, and is not designed for multiple access or intricate querying. As disaster operations escalate, managing large datasets and real-time collaboration becomes increasingly difficult using Excel. The system will be developed in a series of essential steps: Firstly, the gathering of requirements will identify the main data points to track, such as resources, affected areas, and personnel. The second step is designing the database, whereby a schema will be defined to organize and link the data in a way that possesses integrity through primary and foreign keys. The database configuration will then be established, establishing the SQL database for effectively handling huge amounts of data and supporting real-time, concurrent access. Finally, the system will leverage the strong querying feature of SQL to support complex data retrieval, analysis, and reporting to support decision-making in disaster relief. This approach

optimizes data integrity, scalability, real-time collaboration, and decision-making, optimizing the disaster relief process.

Requirements and Target Use: The Hurricane Relief Coordination System will improve disaster response coordination by addressing the limitations of using Excel files in managing and monitoring critical data. Excel is prone to data integrity issues, has scalability limitations, and provides no concurrent access and advanced querying, which can hamper effective disaster response. The system will provide improved data integrity, scalability, real-time collaboration, and decision-making through an SQL database.

Target Users and Roles:

- Hurricane Relief Coordinators (Admin Users):
    - **Role**: Oversee the entire disaster relief process, resource allocation, logistics, and management of personnel.
    - **Requirements**: View all the data to examine the situation, track resource allocation, and generate detailed reports for decision-making and analysis. They must insert, update, and modify data on resources, individuals, and affected areas.
    - **Access Privileges**: Full read, write, and update access to all system modules. They can insert, update, or delete records, and generate and export reports.
- Logistics and Supply Chain Managers:
    - **Duties**: Coordinate and control resources, supplies, and logistic activities, and make appropriate and timely delivery to the affected locations.
    - **Requirements**: Up-to-date information on available resources, current inventory, and supply distribution status. They also require reporting facilities to track the movement of resources.
    - **Access Permissions**: Read and write access to resource inventory and supply distribution records. They can post supply status but not change personnel data and other sensitive information.
- Field Volunteers:
    - **Responsibilities**: Implement grassroots operations, including supplying, aiding those affected, and posting the status of activities.

- Requirements:
    - Location-based data access, such as lists of affected locations, stocked resources, and tasks assigned. They need to be capable of reporting task completion in real time as well.

    - **Privileges of Access**: Read-only access to data for relevant task information and location-based data. They cannot delete or modify data but can report the status of completed tasks.

    - **Responsibilities**: Provide medical care to disaster victims, i.e., field hospitals or open-field clinics.

    - **Needs**: Information access regarding populations affected, drugs, and patient files (if accessible). Need to be updated in medical treatment as well based on reports.

    - **Access Privileges**: Read and write privileges on patient care reports and medical history. No access to staff or logistics information except to health needs. Database Administration will install and maintain the SQL database. The DBA will guarantee that the database is running smoothly, securely, and reliably throughout the disaster recovery.

- The DBA will handle the following:
    - **Database Installation**: Installation of the database, configuration, and performance tuning.
    - **Data Integrity**: Data consistency and validation rules and integrity constraints (e.g., primary and foreign keys) are suitable.
    - **Security**: Managing user access controls, assigning users proper permissions according to their role, and safeguarding sensitive data.

Section 2: Draw an initial ER diagram

- **Overall Entities:** Hurricane, Country, Relief, Volunteer, Logistics (weak), Medical Support (weak), and Administration (weak)

- **Relations and Cardinality:**

- **Hurricane Affects Country** (1:M) - One hurricane can impact multiple countries, but each country is affected by one hurricane at a time.

- **Country Requests Relief** (M: N) - A country may request multiple types of relief, and each relief operation may serve multiple countries.

- **Relief Requires Logistics** (1:M) *(Weak Entity Dependency)* - Each relief effort requires logistics, but logistics exist only if associated with relief efforts.

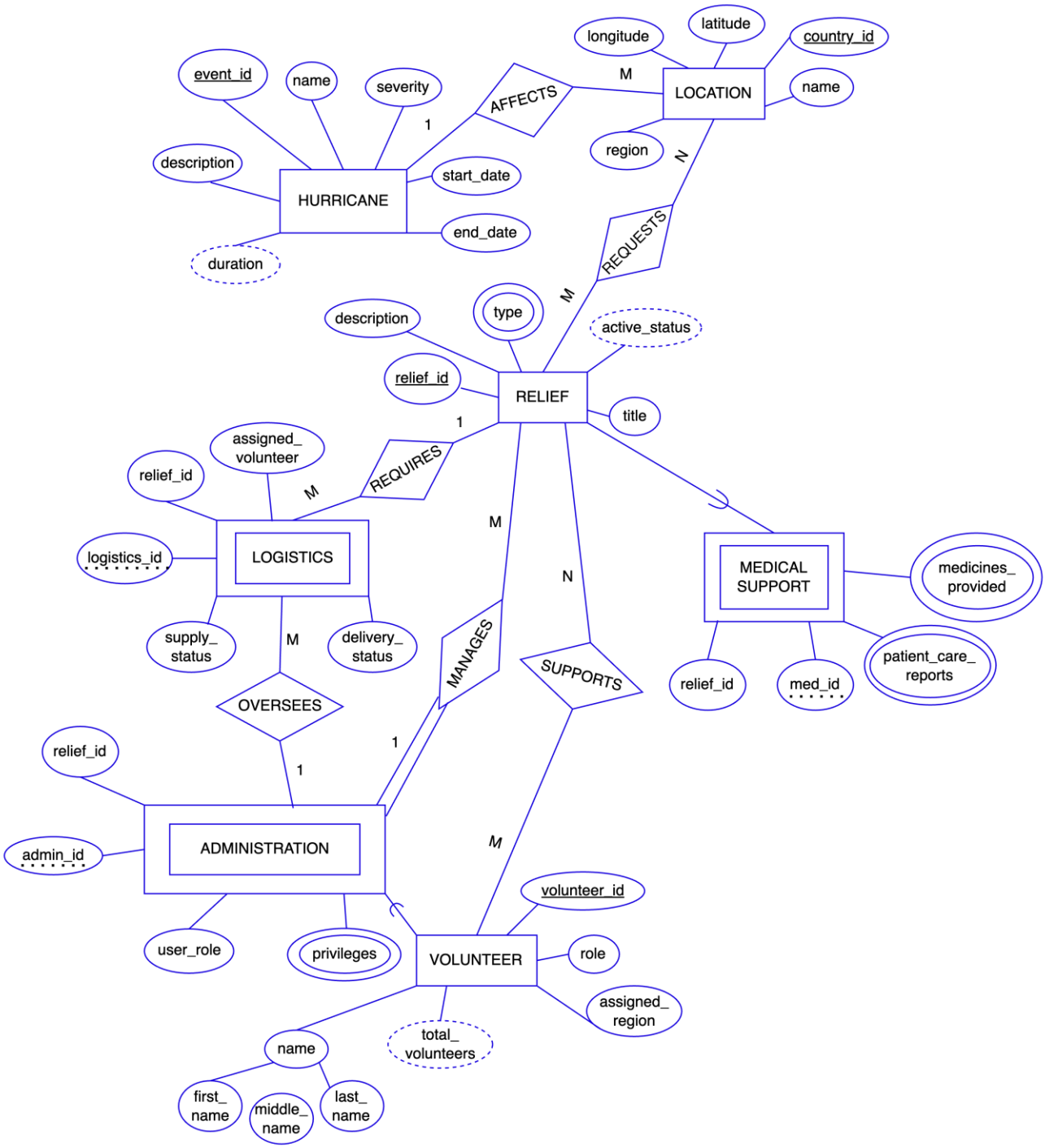
- **Volunteer Supports Relief** (M: N) - Volunteers are assigned to relief efforts, and each relief effort can have multiple volunteers.

- **Medical Support is a Specialized Type of Relief** *(Generalization/Specialization in EER)* - Some relief efforts are medical-related and require additional attributes.

- **Administration Manages the Database** (1:M) - Administrators oversee relief coordination, logistics, and volunteer assignments.

- **Weak Entitles and Hierarchies:**
  - LOGISTICS is a weak entity since it depends on RELIEF.
  - MEDICAL SUPPORT is specialized in RELIEF.
  - ADMINISTRATION is specialized from VOLUNTEER, as administrators have elevated privileges.

- **Assumptions:**
  - Each RELIEF operation is uniquely identified by relief_id.
  - VOLUNTEERS are assigned per region and cannot operate in multiple regions simultaneously.
  - LOGISTIC operations are strictly dependent on RELIEF efforts and cannot exist independently.


event_id
name
severity
AFFECTS
1
M
longitude
latitude
country_id
LOCATION
name
region
N
description
HURRICANE
start_date
end_date
duration
REQUESTS
M
type
description
active_status
relief_id
RELIEF
title
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assigned_
volunteer
relief_id
REQUIRES
M
logistics_id
LOGISTICS
supply_
status
M
delivery_
status
OVERSEES
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M
MANAGES
N
SUPPORTS
MEDICAL
SUPPORT
medicines_
provided
relief_id
med_id
patient_care_
reports
relief_id
admin_id
ADMINISTRATION
1
M
volunteer_id
user_role
privileges
VOLUNTEER
role
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name
first_
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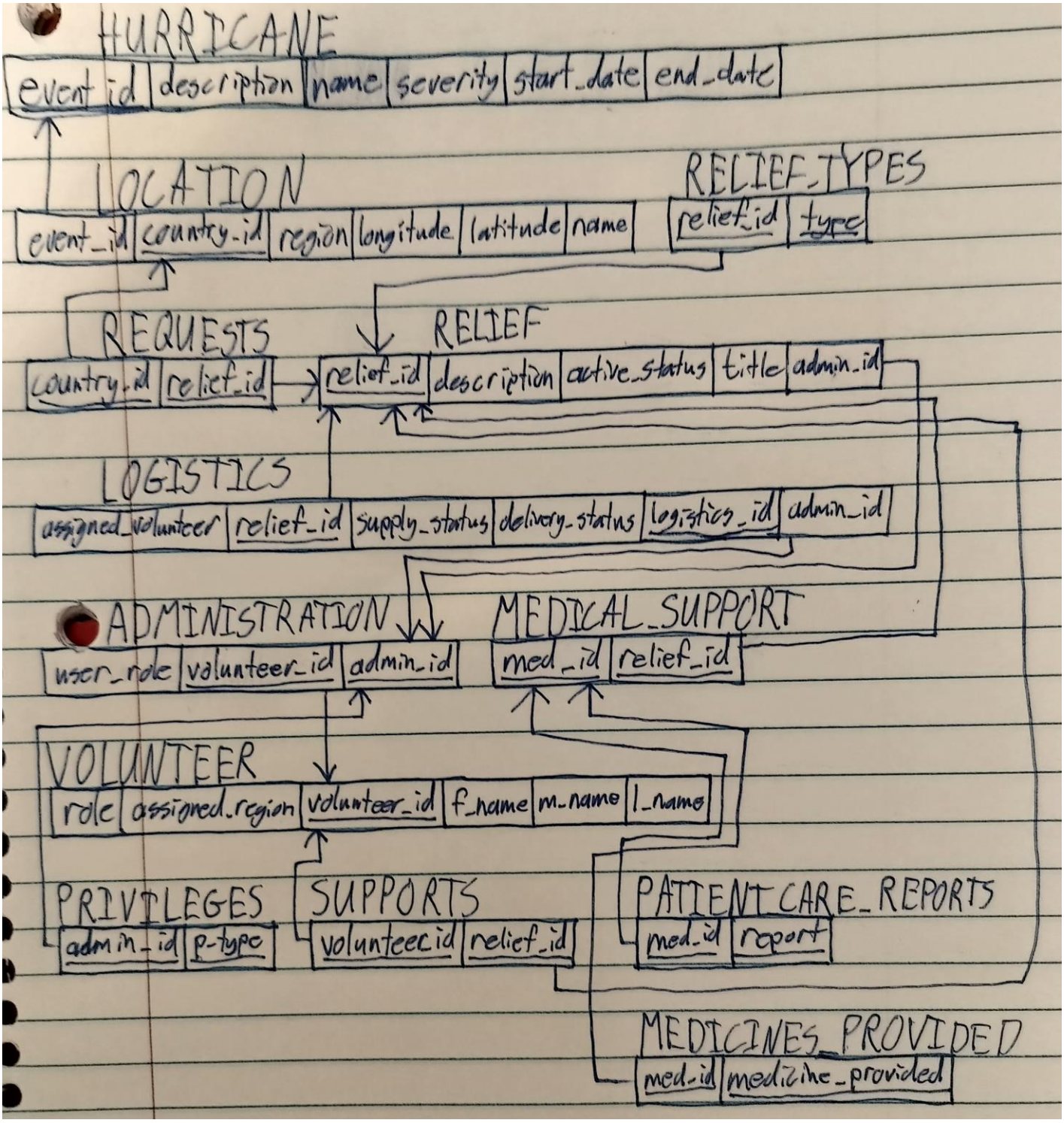
Section 3: Convert your ER diagram into relations.



Section 4: Data:

We'll be using real-world data as we can find a temporary example online. Using real-world data allows the project to reflect actual scenarios, enhancing the authenticity and applicability of the system. It also helps in identifying potential challenges and limitations that might arise in real disaster relief situations. Additionally, working with real data can improve the team's data analysis skills, making the project more robust and credible.

In the current stage, we will use GDACS RSS Information since it is an open-source and easily accessible data set. GDACS issues alerts for earthquakes, tsunamis, tropical cyclones, floods, and volcanoes, using automatic calculations and assessments. Volcanic eruptions and floods are manually introduced, and continuous research and development improve global monitoring. Since we are focusing on Hurricanes, we can limit our data to focus on Hurricanes.

In the future, we'll need to transfer the data to MySQL. To transfer the data to MySQL, first, we will need to clean and format the data to ensure it is compatible with our database schema. Next, we will use a data import tool or SQL commands to load the data into the MySQL tables. Finally, we'll verify that the data has been accurately imported by running queries to check for consistency and integrity.

1. Hurricane Table

Event_id	Name	Severity	description	Start_Date	End_Date	Duration
H001	A	4	Strong winds	6/01/24	6/05/24	4 days
H002	B	3	rainfall	7/10/24	7/13/24	3 days

2. Location Table

Country_id	Name	Region	Latitude	Longitude
C001	USA	Florida	27.6648	-81.5158
C002	MEXICO	Yucatan	20.6843	-88.5678

3. Relief Table

Relief_id	Title	Type	Active	Description
R001	Food Distribution	Food Aid	Active	Emergency Food Packages
R002	Medical Assistance	Medical Aid	Completed	Doctors and nurses providing aid

4. Logistics Table

Logistics_id	Relief_id	Supply_Status	Delivery_Status
L001	R001	In Transit	Pending
L002	R002	Delivered	Completed

5. Medical Support Table

Med_id	Relief_id	Medicines_Provided	Patients_care_reports
M001	R001	Painkillers, Antibiotics	12 Reports

6. Volunteer Table

Volunteer_id	First_Name	Last_Name	Role	Assigned_Region	Total_Volunteers
V001	John	Doe	Field Vol	Florida	50
V002	Alice	Smith	Admin	Yucatan	30

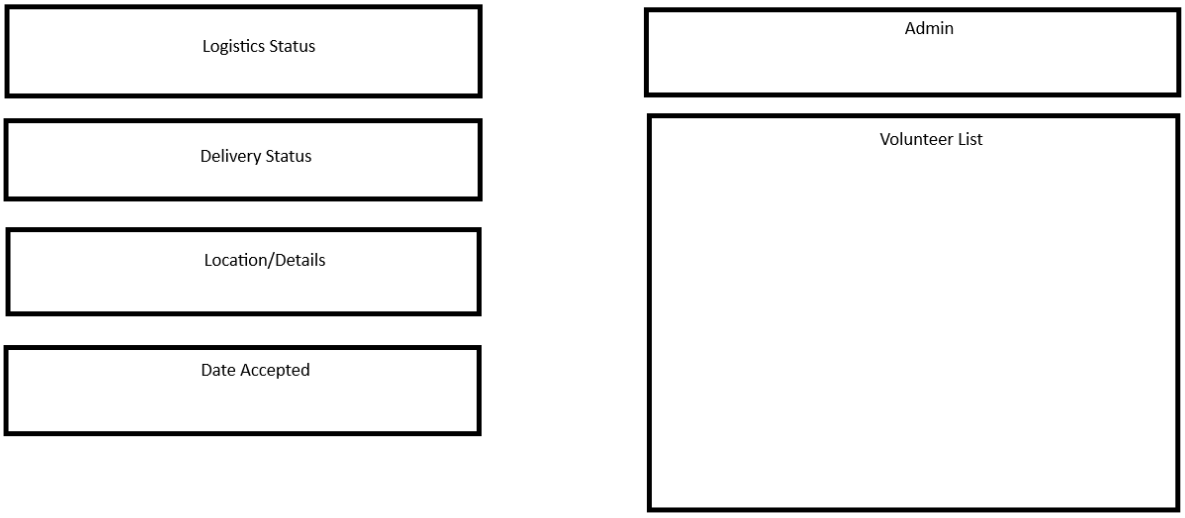
7. Administration Table

Admin_id	User_Role	Privileges
A001	Manager	Full Access

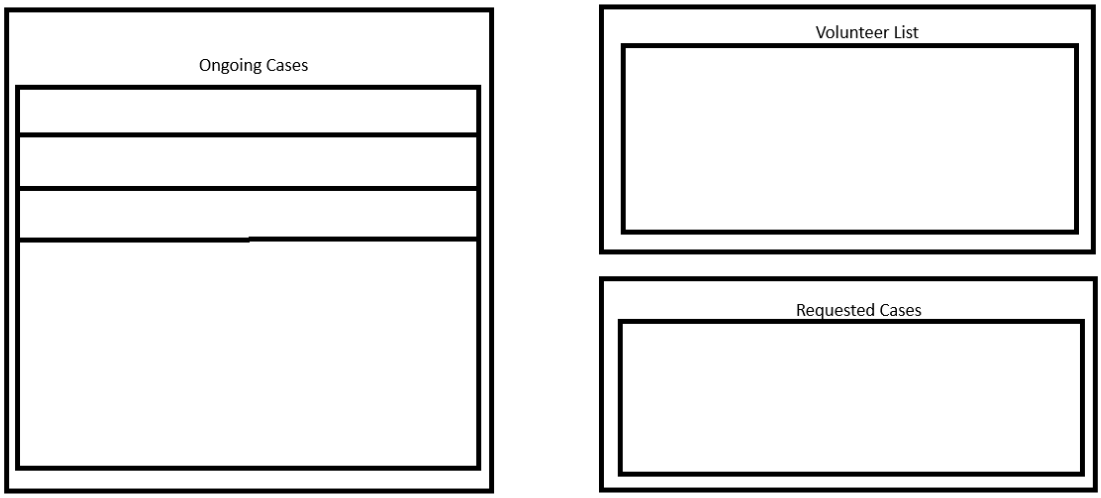
Section 5: (Optional) Interface:

Each screen will lead to a new screen where you can modify the details of each piece of data about primarily open requests. This would include delivery status, logistics details, etc. You will also see all volunteers, admins, etc. for every case. The following includes a rough sketch of what the home and case screens will look like. There are additional screens that will be created, including specific detail screens (setting admins of cases, adding volunteers, changing logistics information, etc.), submission of request screens (from the perspective of those requesting), and more.

Case Screen



Home Screen



Grading rubric for the proposal

Roughly, here is a rubric. It may change or use values in between depending on the writing.

Criteria	Explanation	Scoring
Correctness and Functionality		
Section 1: Proposal details (20%)	Project name, teams, problem statement, and requirements	20%: All provided with sufficient details 15%: A simple one is not there. But others exist with sufficient details. 12%: All exist, one is missing sufficient details (significant) 10%: All exists. Problem statement and requirements are missing sufficient details <10%: One or more are not there. Others are missing details .
Section 2: Draw an initial ER diagram (35%)	ER diagram	35%: All correct 25-30% minor errors exist (maybe few cardinality ratios, maybe few lines wrong. 15-20%: Major errors exist. <15%: The minimum requirements are not met. Also, students use UML diagrams
Section 3: Convert your ER diagram into relations (35%)	Relations	35%: All correct 25-30% minor errors exist. 15-20%: Major errors exist. <15%: Something is significantly wrong
Others (10%)	Section 4 and 5 along with formatting	10%: All provided with sufficient details 5-10% Minor things are missing <5% Major things are missing
Overall (100%)		
Overall (50)		