ADAMA SCINCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

DEPARTMENT OF SOFTWARE ENGINEERING

SOFTWARE PROCESS AND PROJECT MANAGEMENT

DIGITAL ADDRESS REGISTRATION SYSTEM

SOFTWARE DESIGN DOCUMENTATION

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Submitted to Mr. Gemechu

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2024 G.C

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Introduction

System Overview

System Description

The Digital Address Registration System (DARS) is a comprehensive digital platform designed to revolutionize address management in Ethiopia. It aims to enhance the accuracy, usability, and speed of address information, making it more accessible and efficient for individuals and organizations. The system encompasses the entire hierarchy of address components, starting from regional details down to house numbers. By transitioning address data into a digital format, the project aims to eliminate limitations and inaccuracies associated with paper-based records and fragmented digital databases.

System Goals and Objectives

The primary goal of the DARS project is to develop a digital address system that covers all regions, zones, districts, neighborhoods, streets, and houses throughout Ethiopia. The objectives include:

1. Create a comprehensive and reliable digital platform for registering and organizing addresses.

2. Make address information easily accessible to users worldwide through a web-based platform.

3. Improve the accuracy and coverage of the address database through user contributions.

4. Develop a robust address management system to ensure the maintenance of accurate and up-to-date information.

5. Advance address registration and management in Ethiopia, improving efficiency and accessibility for individuals, organizations, and government entities.

System Scope and Boundaries

The scope of the DARS project includes capturing and storing address information at various levels, from regions to individual house numbers. It aims to cover all regions, zones, districts, neighborhoods, streets, and houses throughout Ethiopia. The system provides user registration and login functionalities, an interactive map for address exploration and search, and allows users to contribute address information. The project also incorporates a robust address management system. The boundaries of the system are defined by the address components within Ethiopia and the functionalities required to manage and access address information.

Design Document Overview

Purpose of the Document

The purpose of this design document is to provide a comprehensive overview of the design aspects of the DARS project. It describes the architectural design, system components, modules, and their interactions. The document serves as a guide for the development team, outlining the design principles, patterns, and technologies to be used in the implementation of the system.

Scope of the Document

This design document focuses on the software design aspects of the DARS project. It covers the architectural overview, system components, and their interactions. It provides detailed information about the design decisions, data structures, algorithms, user interfaces, and integration points within the system.

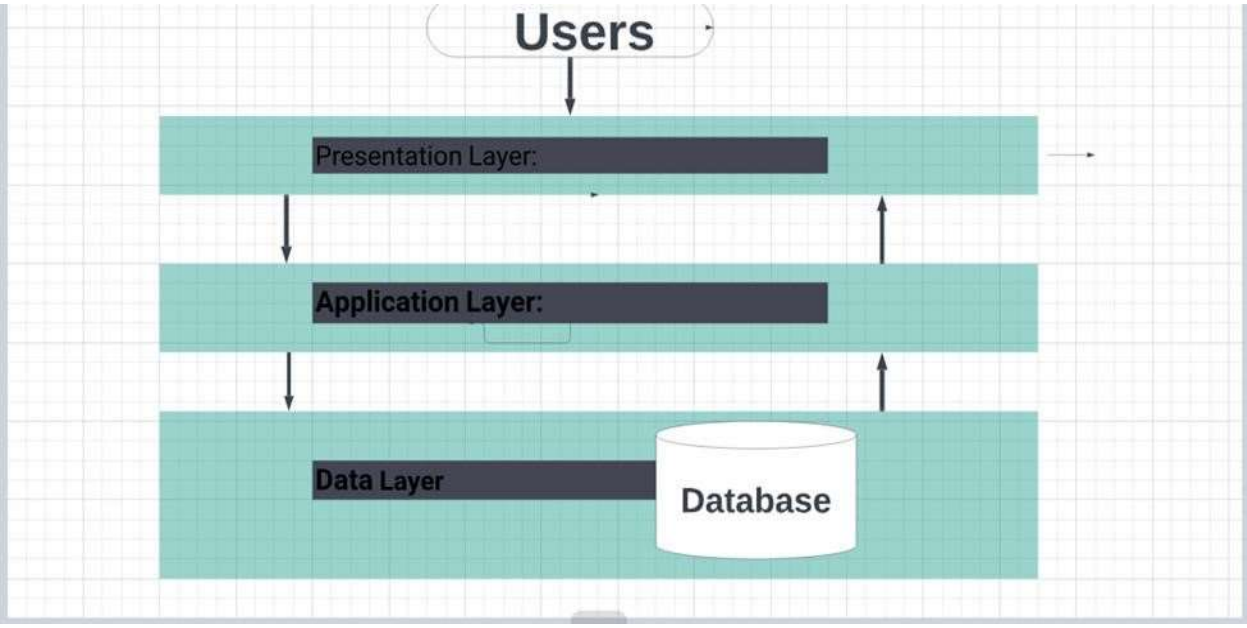
Intended Audience

The intended audience for this software design documentation includes the development team, software engineers, system architects, project managers, and stakeholders involved in the DARS project. It provides technical details and insights into the design aspects of the system, facilitating understanding, collaboration, and implementation of the project.

System Architecture

System Architecture Diagram

The Digital Address Registration System (DARS) is designed using a three-tier architecture, consisting of the following components:



Component Overview

Presentation Layer: This layer handles the user interface and user interactions. It includes web pages created using HTML, CSS, and JavaScript providing a user-friendly interface for registration, data submission, and address exploration.

Application Layer: The core logic of DARS resides in this layer. It is built using PHP, JavaScript, and AJAX for handling user authentication, data validation, address registration, and communication with the database.

Data Layer: XAMPP, which includes MySQL as the relational database management system, is used to store and manage address-related information. This layer ensures data integrity and accessibility.

System Interaction

The system interaction in the Digital Address Registration System (DARS) can be described as down below:

1. User Registration:

- The user interacts with the Presentation Layer by accessing the registration web page.
- The Presentation Layer collects the user's registration details, such as username, password, and personal information.
- The Application Layer receives the user's registration request from the Presentation Layer.
- The Application Layer validates the user's inputs, checks for any duplicate usernames, and performs necessary data verification.
- If the registration details are valid, the Application Layer communicates with the Data Layer to store the user's information in the database.
- The Data Layer stores the user's registration details in the appropriate tables of the database.

2. Address Search:

- The user interacts with the Presentation Layer by inputting search criteria, such as region, zone, district, or street name.
- The Presentation Layer sends the search query to the Application Layer.
- The Application Layer receives the search query and communicates with the Data Layer.
- The Application Layer queries the database based on the search criteria.
- The Data Layer retrieves the relevant address information from the database.
- The Application Layer processes the retrieved data and sends it back to the Presentation Layer.
- The Presentation Layer displays the search results to the user.

3. Address Contribution:

- The user interacts with the Presentation Layer by accessing the data submission web page.
- The Presentation Layer collects the user's address contribution, including the region, zone, district, neighborhood, street, and house number.
- The Application Layer receives the address contribution request from the Presentation Layer.
- The Application Layer validates the user's inputs and performs necessary data verification.
- If the address contribution is valid, the Application Layer communicates with the Data Layer to store the new address information in the database.
- The Data Layer stores the new address details in the appropriate tables of the database.

4. User Authentication:

- The user interacts with the Presentation Layer by entering their username and password.
- The Presentation Layer sends the login credentials to the Application Layer.
- The Application Layer receives the login request and communicates with the Data Layer to verify the user's credentials.
- The Data Layer checks the entered username and password against the stored user information in the database.
- If the credentials are valid, the Application Layer grants access to the user.
- The Presentation Layer provides access to the system's functionalities for the authenticated user.

These system interactions demonstrate how the Presentation Layer, Application Layer, and Data Layer work together to handle user registration, address search, address contribution, and user authentication in the Digital Address Registration System (DARS).

Component interaction

The interaction between the Presentation Layer, Application Layer, and Data Layer in the Digital Address Registration System (DARS) can be like this: -

1. User Interactions

- The Presentation Layer provides the user interface, including web pages and forms, for users to interact with the system.
- Users input data, such as registration details, search criteria, or address contributions, through the Presentation Layer.

- The Presentation Layer collects and validates user inputs before sending them to the Application Layer for further processing.

2. Data Processing and Logic

- The Application Layer contains the core logic of DARS. It receives user inputs and performs various operations, such as user authentication, data validation, and address registration.
- The Application Layer communicates with the Presentation Layer to receive user inputs and provide system outputs.
- It processes user inputs, validates them, and performs necessary checks before interacting with the Data Layer.

3. Data Storage and Retrieval

- The Data Layer utilizes XAMPP, which includes MySQL as the relational database management system, for storing and managing address-related information.
- The Application Layer communicates with the Data Layer to store new address data, retrieve address information based on user queries, and update existing records.
- The Data Layer stores the address-related data in the MySQL database, ensuring data integrity and accessibility.

The Presentation Layer serves as the interface between users and the system, collecting user inputs and displaying system outputs. The Application Layer handles the core logic and processing of user inputs, interacting with the Presentation Layer for input/output operations and with the Data Layer for data storage and retrieval. The Data Layer manages the storage and retrieval of address-related data in the MySQL database, serving as the backend for the system.

Component Design

Component 1: Front-end User Interface

- Component description: This component is responsible for creating the user interface of the DARS website. It includes the design and layout of web pages, user registration and login functionalities, and an interactive map for address exploration and search.
- Component functionality: The front-end user interface component enables users to interact with the DARS system. It provides a visually appealing and user-friendly interface that allows users to register, log in, and access various features of the system, such as searching for addresses and contributing address information.
- Component interfaces: The front-end user interface component interacts with the back-end system through API calls. It communicates user inputs, such as registration data and address search queries, to the back-end for processing and retrieves relevant data to display on the user interface.
- Component data structures: The front-end user interface component utilizes HTML, CSS, Bootstrap, and JavaScript to create web pages and handle user interactions. It may also utilize JSON or other data formats to exchange data with the back-end system.

Component 2: Back-end Address Management System

- Component description: This component is responsible for managing address data in the DARS system. It includes functionalities for storing, retrieving, and updating address information in the database.
- Component functionality: The back-end address management system component handles the core operations related to address data. It stores address information in a relational database, retrieves addresses based on user queries, and allows for the addition and update of address records. It also ensures data integrity and consistency in the address database.

- Component interfaces: The back-end address management system component interfaces with the front-end user interface component through PHP and jQuery. It receives user requests for address-related operations, such as adding or searching for addresses, and processes them accordingly. It utilizes PHP for server-side processing and interacts with the database management system, such as MySQL, to perform database operations. jQuery is used for client-side interactions and dynamic updates within the user interface.
- Component data structures: The back-end address management system component utilizes server-side scripting languages like PHP to handle user requests and interact with the database. It may utilize SQL queries to retrieve and manipulate address data in the database.

Interface Design

User Interface

The user interface of the Digital Address Registration System (DARS) is designed to be user-friendly and intuitive, catering to a diverse audience ranging from government entities to the general public. It provides a seamless experience for users to interact with the system and access address-related information efficiently.

User Interface Description

The user interface of DARS includes the following components:

1. Home Page: The home page serves as the entry point to the system. It provides an overview of the system's features and allows users to navigate to different sections.

2. Registration and Login: DARS offers user registration and login functionalities. Users can create an account and log in to access personalized features and contribute to the address database.

3. Interactive Map: The system incorporates an interactive map that allows users to explore and search for addresses. Users can zoom in and out, pan the map, and perform searches to locate specific addresses or areas.

4. Address Information Display: When users search for a specific address, the system displays relevant information such as region, zone, woreda, kebele, street, and house number. This information is presented in a clear and organized manner.

5. Address Contribution: Users have the ability to contribute address information to enhance the accuracy and coverage of the database. They can add new addresses or update existing ones, ensuring that the system remains up-to-date.

6. User Profile: DARS provides a user profile section where users can manage their account information, view their contributions, and track their activity within the system.

User Interface Wireframes

This software design documentation includes wireframes that illustrate the layout and structure of the user interface. These wireframes depict the arrangement of various elements on each page, including navigation menus, input fields, buttons, and information displays. The wireframes provide a visual representation of how the user interface will look and help guide the development process.

User Interface Requirements

The software design documentation specifies the user interface requirements for DARS. These requirements outline the functional and non-functional aspects of the user interface, including:

- Responsive Design: The user interface should be responsive and adapt to different screen sizes and devices, ensuring a consistent experience across platforms.

- Intuitive Navigation: The user interface should have clear and intuitive navigation menus, allowing users to easily move between different sections and access the desired features.

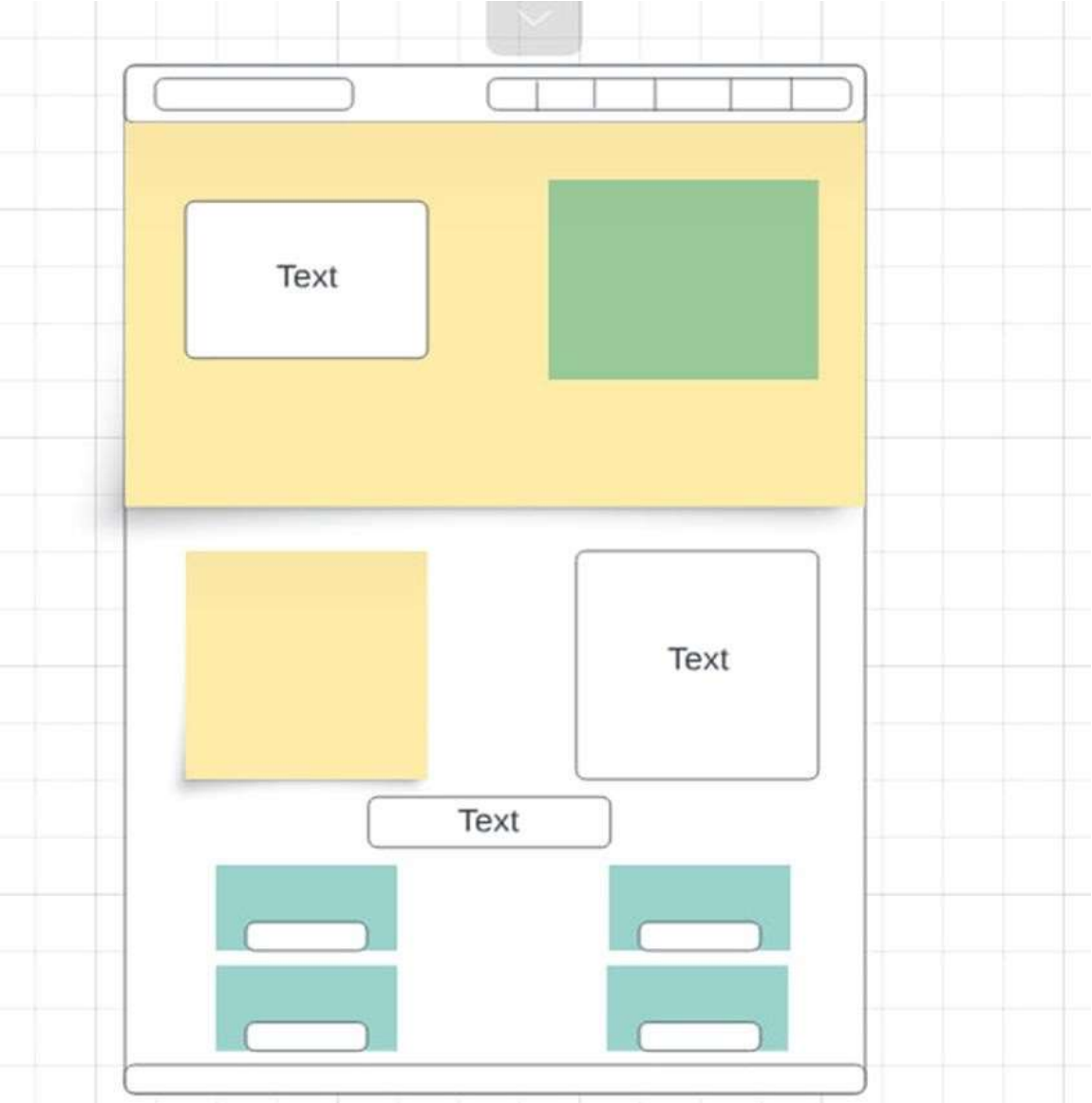
- Accessibility: The user interface should adhere to accessibility standards, ensuring that it is usable by individuals with disabilities and compliant with relevant accessibility guidelines.

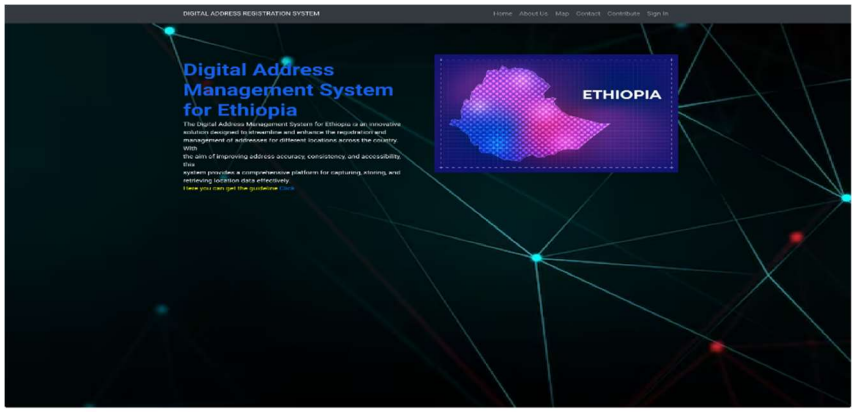
- Error Handling: The user interface should provide informative error messages and guidance to users in case of invalid inputs or system errors.

- Consistent Design: The user interface should maintain a consistent design language, including color schemes, typography, and visual elements, throughout the system.

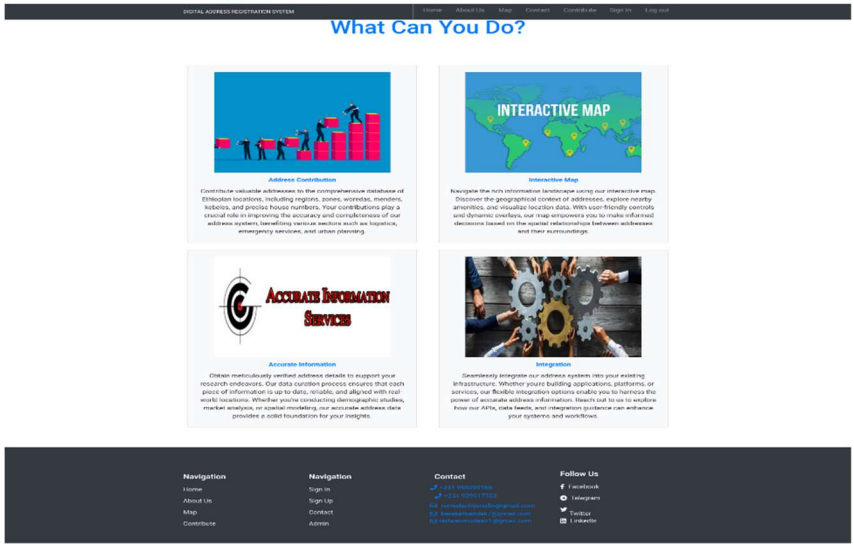
These user interface requirements serve as guidelines for the development team to create a user interface that meets the needs of the users and aligns with the overall objectives of the DARS project.

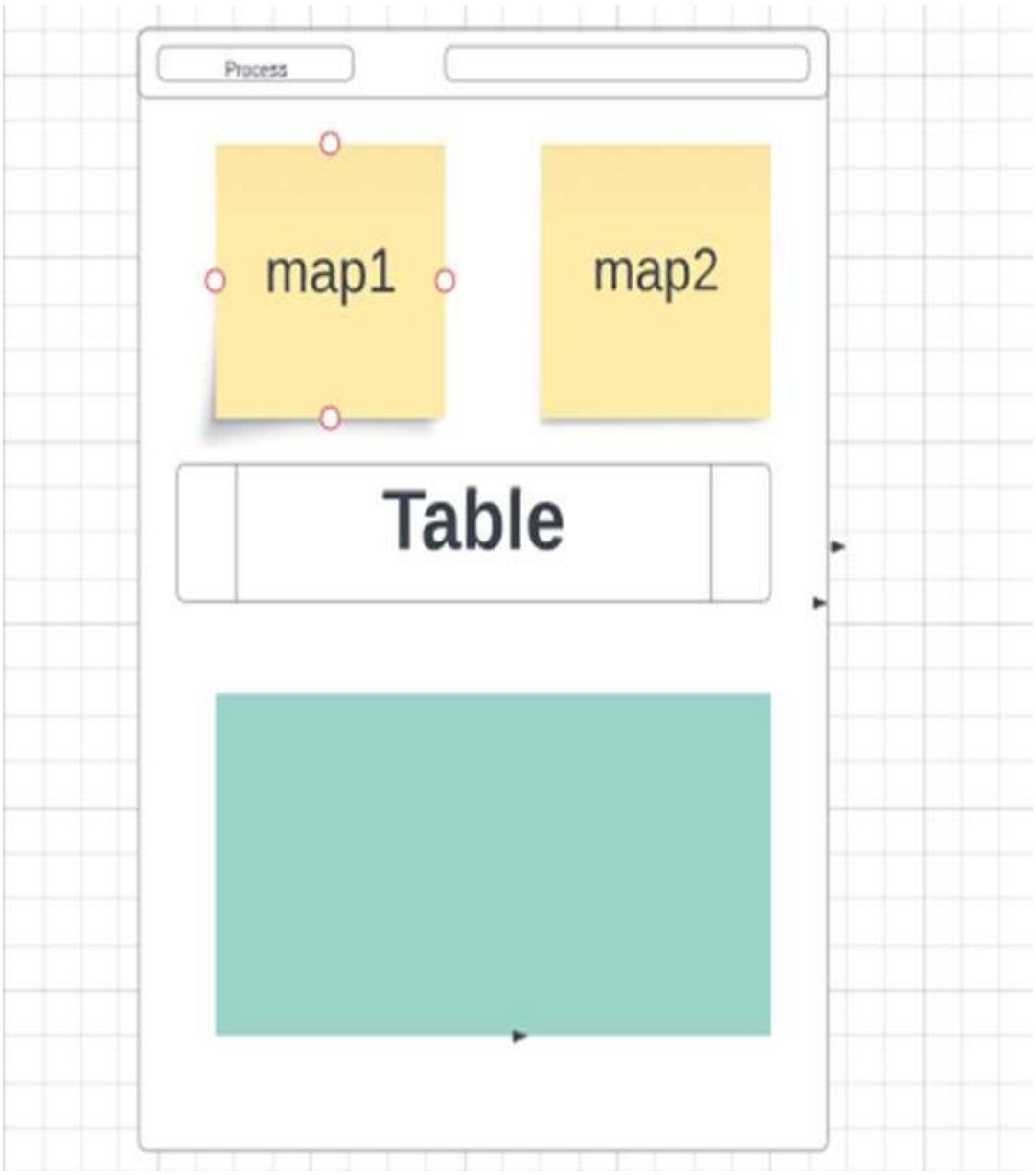
Some Interface design with the wireframe and the figma design shown as follows down below: -

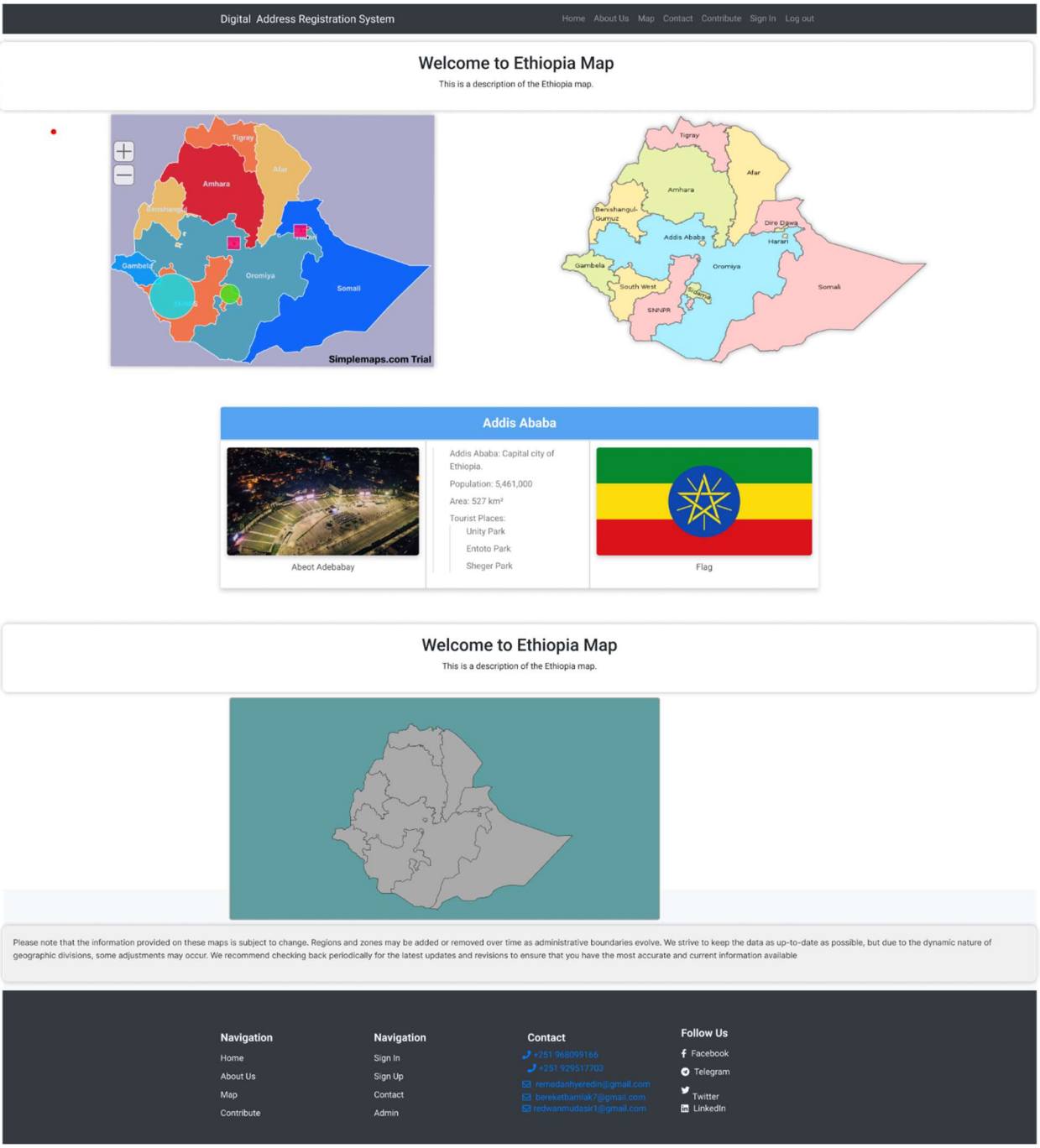



DIGITAL ADDRESS REGISTRATION SYSTEM
Home About Us Map Contact Contribute Sign In
Digital Address Management System for Ethiopia
ETHIOPIA


CONTRIBUTE
Notice: Contribution Guidelines
SURE I want to contribute


What Can You Do?
INTERACTIVE MAP
Address Contribution
Interactive Map
Accurate Information
Integration
Navigation
Navigation
Contact
Follow Us


Process
map1
map2
Table


Digital Address Registration System
Home About Us Map Contact Contribute Sign In Log out
Welcome to Ethiopia Map
This is a description of the Ethiopia map.
Tigray
Afar
Amhara
Gambela
Oromiya
Somali
Simplemaps.com Trial
Tigray
Afar
Amhara
Benishangul-Gumuz
Dire Dawa
Addis Ababa
Harari
Gambela
Oromiya
South West
Somali
SNNPR
Addis Ababa
Addis Ababa: Capital city of Ethiopia.
Population: 5,461,000
Area: 527 km²
Tourist Places:
Unity Park
Entoto Park
Sheger Park
Abeot Adebabay
Flag
Welcome to Ethiopia Map
This is a description of the Ethiopia map.
Please note that the information provided on these maps is subject to change. Regions and zones may be added or removed over time as administrative boundaries evolve. We strive to keep the data as up-to-date as possible, but due to the dynamic nature of geographic divisions, some adjustments may occur. We recommend checking back periodically for the latest updates and revisions to ensure that you have the most accurate and current information available
Navigation
Home
About Us
Map
Contribute
Navigation
Sign In
Sign Up
Contact
Admin
Contact
+251 968099166
+251 929517703
remedanhyeredin@gmail.com
bereketbamlak7@gmail.com
redwanmudasir1@gmail.com
Follow Us
Facebook
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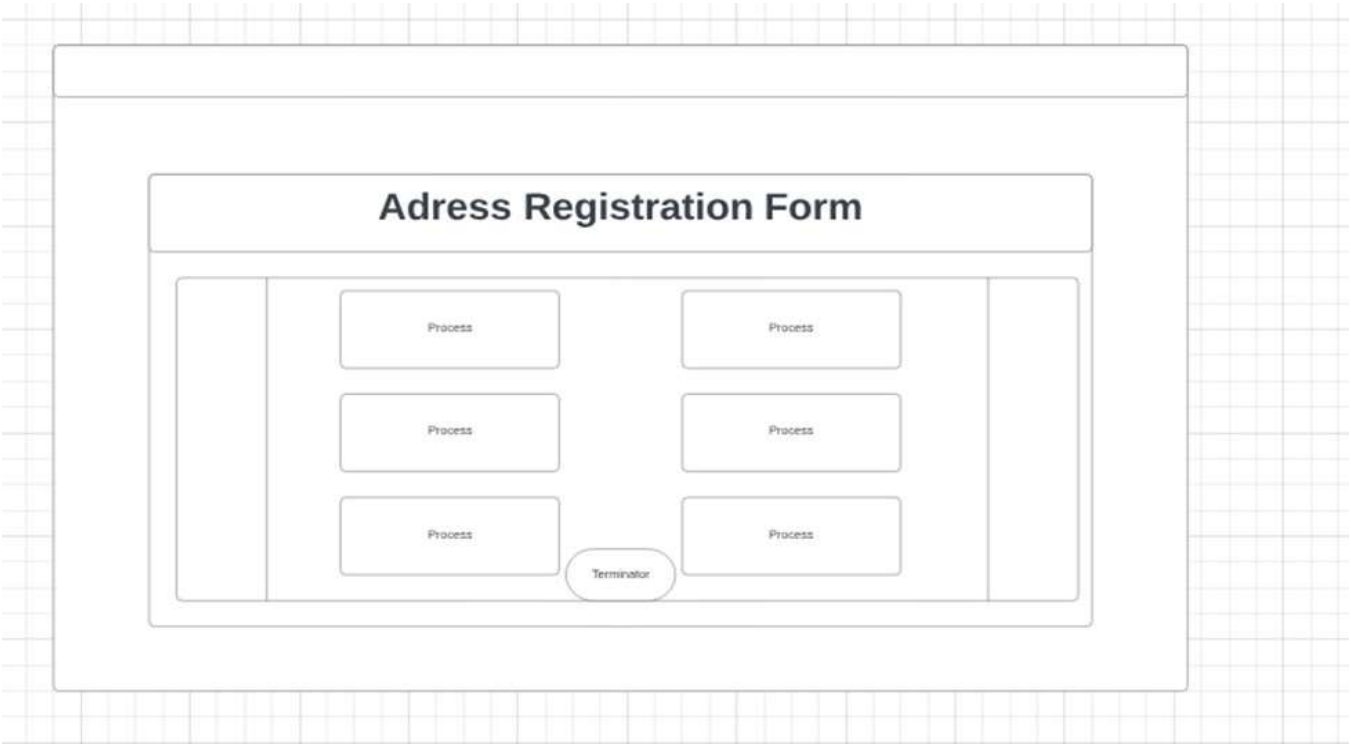
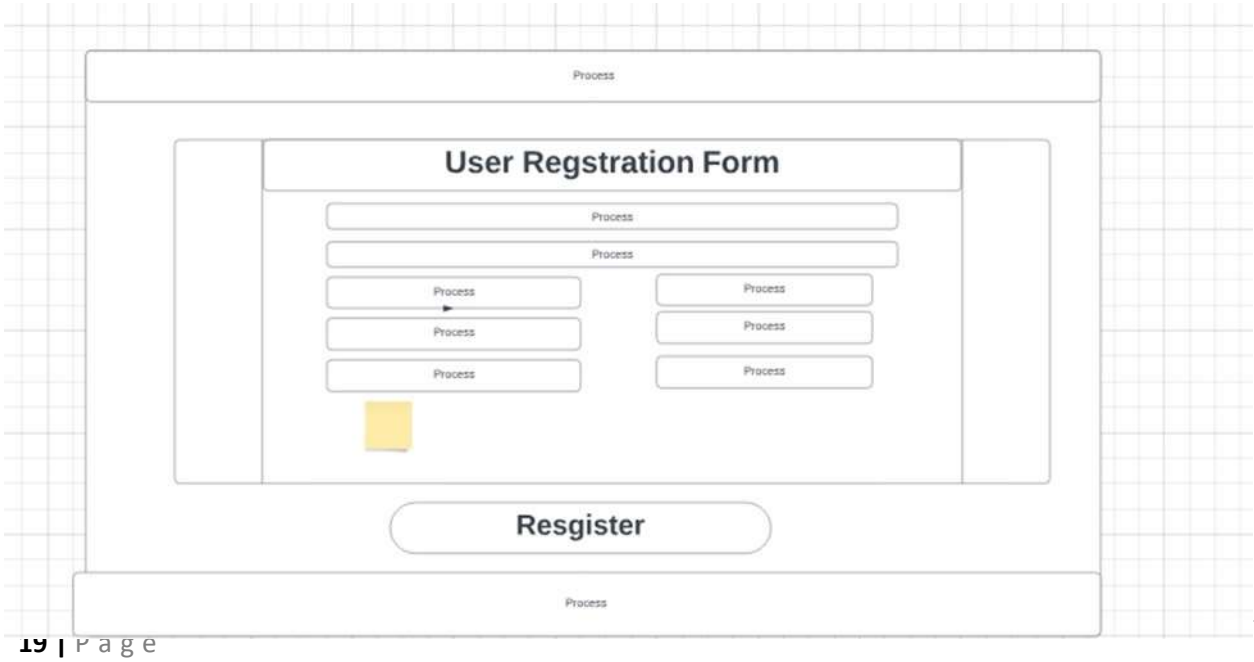
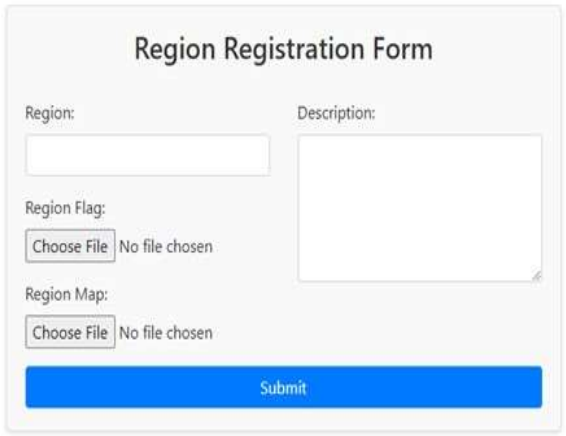
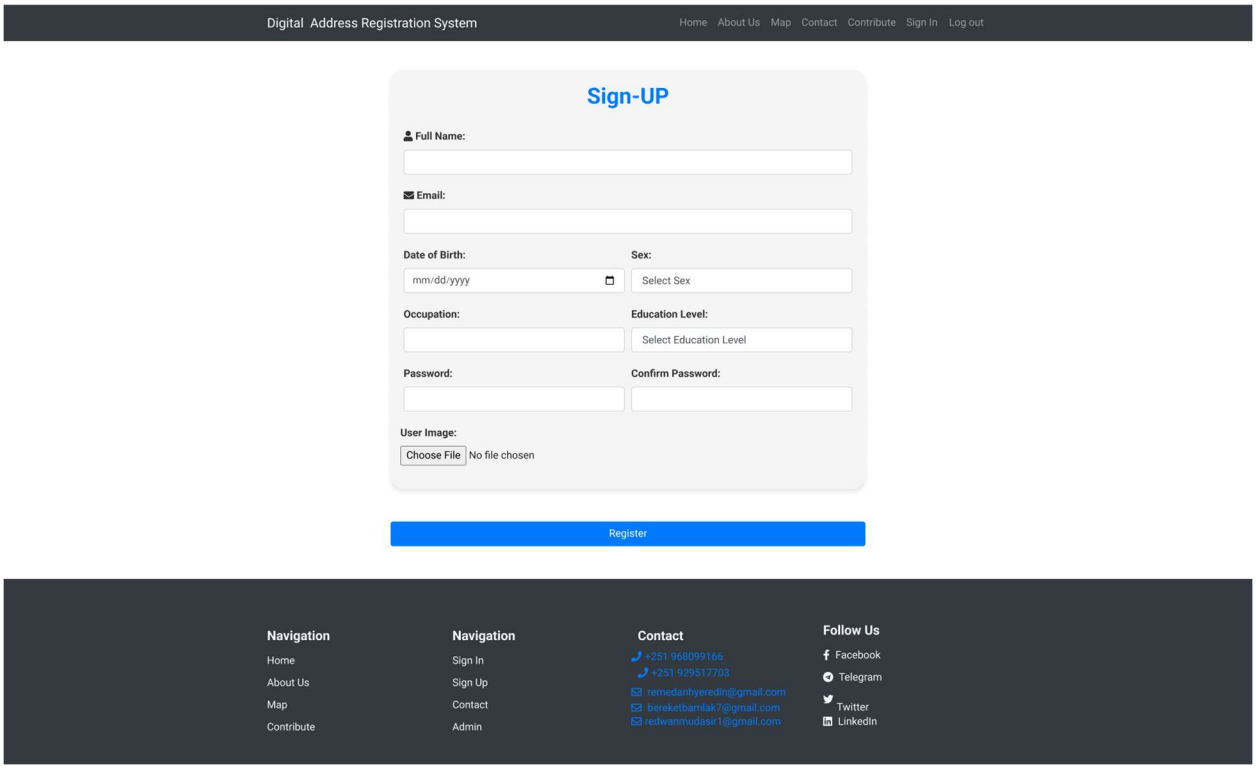

Adress Registration Form
Process
Process
Process
Process
Process
Process
Terminator


Process
User Regstration Form
Process
Process
Process
Process
Process
Process
Process
Process
Resgister
Process


Region Registration Form
Region:
Description:
Region Flag:
Choose File
No file chosen
Region Map:
Choose File
No file chosen
Submit


Digital Address Registration System
Home
About Us
Map
Contact
Contribute
Sign In
Log out
Sign-UP
Full Name:
Email:
Date of Birth:
mm/dd/yyyy
Sex:
Select Sex
Occupation:
Education Level:
Select Education Level
Password:
Confirm Password:
User Image:
Choose File
No file chosen
Register
Navigation
Home
About Us
Map
Contribute
Navigation
Sign In
Sign Up
Contact
Admin
Contact
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+251 929517703
remedanhyeredin@gmail.com
bereketbamlak7@gmail.com
redwanmudasir1@gmail.com
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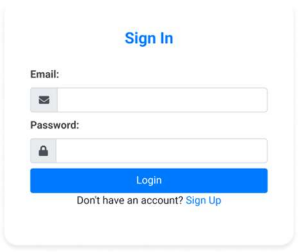
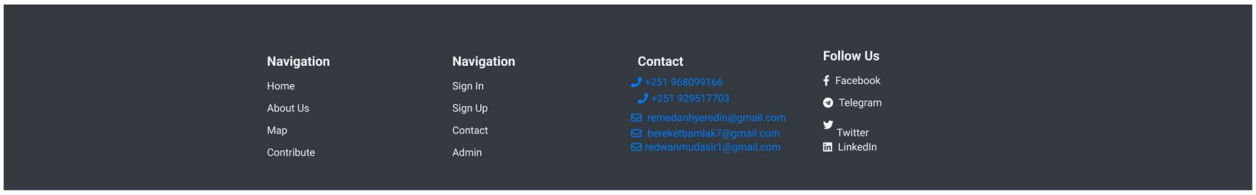
Telegram
Twitter
LinkedIn


Process
Sign_in
Process
Process
Login
Process


Digital Address Registration System
Home
About Us
Map
Contact
Contribute
Sign In
Log out


Sign In
Email:
Password:
Login
Don't have an account? Sign Up


Navigation
Home
About Us
Map
Contribute
Navigation
Sign In
Sign Up
Contact
Admin
Contact
+251 968099166
+251 929517703
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bereketbamlak7@gmail.com
redwanmudasir1@gmail.com
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Data Design

Data schema

Database Schema Overview

The database schema is designed to efficiently store and manage address-related information, encompassing regions, zones, wordas, kebeles, menders, and house numbers in Ethiopia. It consists of multiple structured tables interconnected to ensure data integrity and facilitate precise geographical representation.

Table Descriptions

- Region Table:
  - Fields: region_id, region_name, region_flag, region_map, description
  - Description: This table stores comprehensive data concerning regions, including unique identifiers (region_id), region names (region_name), corresponding flags (region_flag), region maps (region_map), and detailed descriptions (description).
- Zone Table:
  - Fields: zone_id, zone_name, region_id, zone_map, description
  - Description: The zone table houses essential information about zones.
  - It comprises fields such as zone_id (a unique identifier), zone_name (the name of the zone), region_id (a reference to the region it belongs to), zone_map (a map of the zone), and a comprehensive description.
- Worda Table:
  - Fields: worda_id, region_id, zone_id, worda_name, map, description

- Description: This table captures detailed data about wordas. It maintains references to the corresponding region (region_id) and zone (zone_id). Additionally, it contains worda names (worda_name), maps (map), and comprehensive descriptions (description).

- Kebele Table:
  - Fields: kebela_id, region_id, zone_id, worda_id, kebela_name, kebela_map, description
  - Description: The kebele table provides a comprehensive view of kebeles within the address system. It references region (region_id), zone (zone_id), and worda (worda_id) for hierarchical organization. Key attributes include kebela_name (the name of the kebele), kebela_map (a map representation), and detailed descriptions.

- Mender Table:
  - Fields: mender_id, region_id, zone_id, worda_id, kebela_id, mender_name, mender_map, description
  - Description: This table stores information related to menders. It establishes connections with region, zone, worda, and kebele entities. Important fields include mender_name (the mender's name), mender_map (a map representing the mender's location), and comprehensive descriptions.

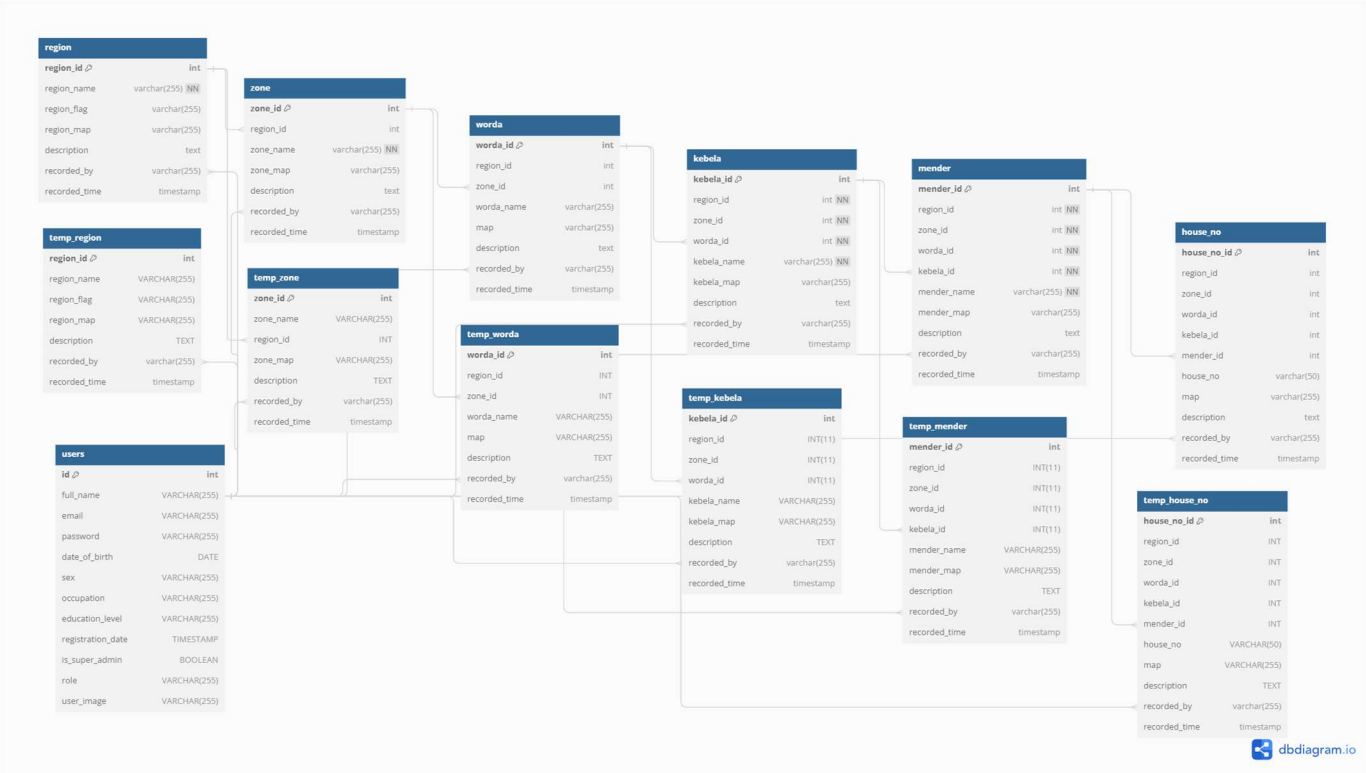
- House Number Table:
  - Fields: house_no_id, region_id, zone_id, worda_id, kebela_id, mender_id, house_no, map, description
  - Description: The house number table houses data about specific house numbers. It maintains relationships with region, zone, worda, kebele, and mender entities. Critical attributes encompass house_no (the house number), map (a map representation), and detailed descriptions.

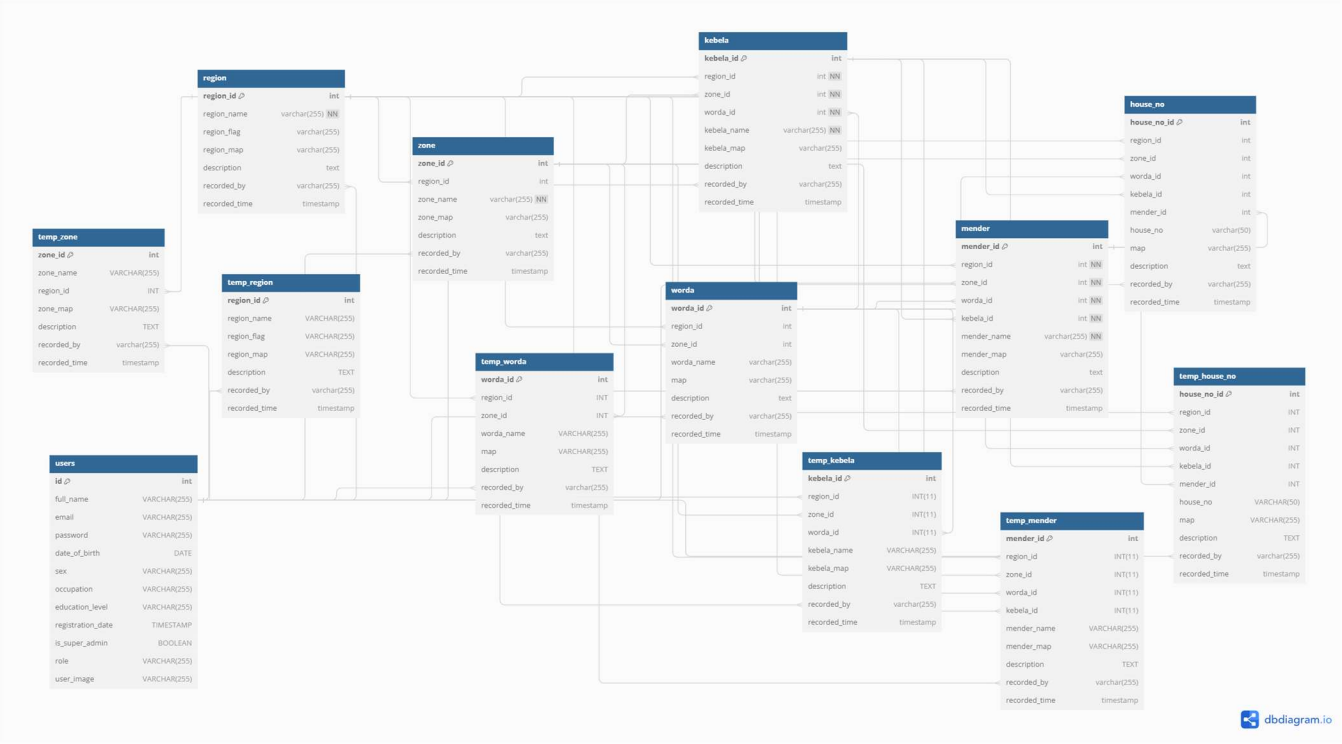
- Temp Table:
  - Fields: Region, Temp Zone, Temp Worda, Temp Kebele, Temp Mender, and Temp House Number Tables:
  - Description: These temporary tables are employed for efficient data management during address contributions. They ensure data consistency and accuracy while undergoing the contribution process.

You can check the diagram by using those two links down below for more information.

https://dbdiagram.io/d/64fd3a2e02bd1c4a5e4623b4

https://dbdiagram.io/d/64f2004302bd1c4a5ed0ab22




region
region_id int
region_name varchar(255) NN
region_flag varchar(255)
region_map varchar(255)
description text
recorded_by varchar(255)
recorded_time timestamp
kebela
kebela_id int
region_id int NN
zone_id int NN
worda_id int NN
kebela_name varchar(255) NN
kebela_map varchar(255)
description text
recorded_by varchar(255)
recorded_time timestamp
house_no
house_no_id int
region_id int
zone_id int
worda_id int
kebela_id int
mender_id int
house_no varchar(50)
map varchar(255)
description text
recorded_by varchar(255)
recorded_time timestamp
zone
zone_id int
region_id int
zone_name varchar(255) NN
zone_map varchar(255)
description text
recorded_by varchar(255)
recorded_time timestamp
mender
mender_id int
region_id int NN
zone_id int NN
worda_id int NN
kebela_id int NN
mender_name varchar(255) NN
mender_map varchar(255)
description text
recorded_by varchar(255)
recorded_time timestamp
temp_zone
zone_id int
zone_name VARCHAR(255)
region_id INT
zone_map VARCHAR(255)
description TEXT
recorded_by varchar(255)
recorded_time timestamp
temp_region
region_id int
region_name VARCHAR(255)
region_flag VARCHAR(255)
region_map VARCHAR(255)
description TEXT
recorded_by varchar(255)
recorded_time timestamp
worda
worda_id int
region_id int
zone_id int
worda_name varchar(255)
map varchar(255)
description text
recorded_by varchar(255)
recorded_time timestamp
temp_worda
worda_id int
region_id INT
zone_id INT
worda_name VARCHAR(255)
map VARCHAR(255)
description TEXT
recorded_by varchar(255)
recorded_time timestamp
temp_house_no
house_no_id int
region_id INT
zone_id INT
worda_id INT
kebela_id INT
mender_id INT
house_no VARCHAR(50)
map VARCHAR(255)
description TEXT
recorded_by varchar(255)
recorded_time timestamp
users
id int
full_name VARCHAR(255)
email VARCHAR(255)
password VARCHAR(255)
date_of_birth DATE
sex VARCHAR(255)
occupation VARCHAR(255)
education_level VARCHAR(255)
registration_date TIMESTAMP
is_super_admin BOOLEAN
role VARCHAR(255)
user_image VARCHAR(255)
temp_kebela
kebela_id int
region_id INT(11)
zone_id INT(11)
worda_id INT(11)
kebela_name VARCHAR(255)
kebela_map VARCHAR(255)
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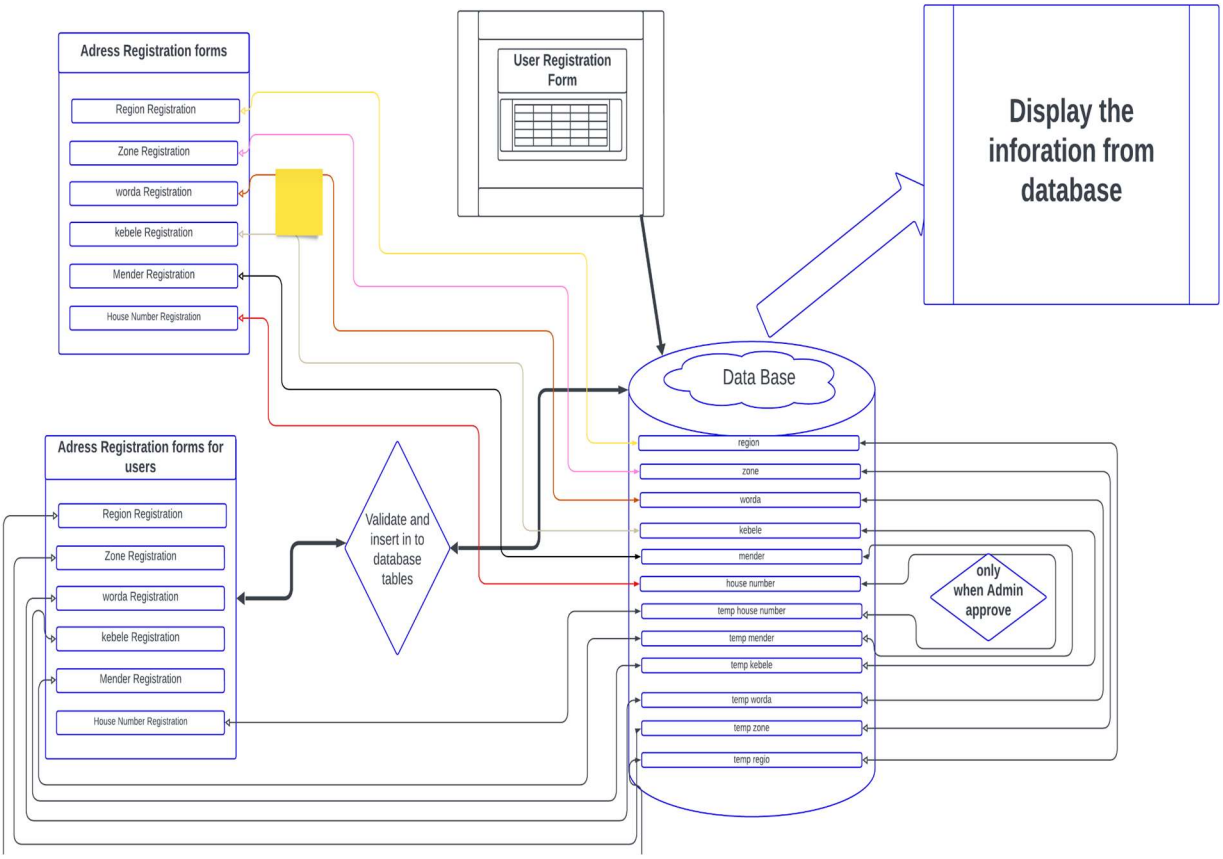
recorded_by varchar(255)
recorded_time timestamp
temp_mender
mender_id int
region_id INT(11)
zone_id INT(11)
worda_id INT(11)
kebela_id INT(11)
mender_name VARCHAR(255)
mender_map VARCHAR(255)
description TEXT
recorded_by varchar(255)
recorded_time timestamp
dbdiagram.io

Data flow diagram

A data flow diagram (DFD) is a graphical representation that illustrates the flow of data within a system. It shows how data is input, processed, and outputted in a system, along with the various processes, data sources, data stores, and external entities involved.

For the digital address registration system, we construct a data flow diagram a shown below: -



Conclusion

In conclusion, the Digital Address Registration System (DARS) is a comprehensive digital platform designed to revolutionize address management in Ethiopia. The system aims to enhance the accuracy, usability, and speed of address information, making it more accessible and efficient for individuals and organizations. By transitioning address data into a digital format, DARS eliminates limitations and inaccuracies associated with paper-based records and fragmented digital databases.

The goals and objectives of the DARS project include creating a comprehensive and reliable digital platform for registering and organizing addresses, making address information easily accessible to users worldwide through a web-based platform, improving the accuracy and coverage of the address database through user contributions, developing a robust address management system to ensure accurate and up-to-date information, and advancing address registration and management in Ethiopia to improve efficiency and accessibility.

The system architecture of DARS is based on a three-tier model, consisting of the Presentation Layer, Application Layer, and Data Layer. The Presentation Layer handles the user interface and interactions, the Application Layer contains the core logic and processing of user inputs, and the Data Layer manages the storage and retrieval of address-related data in the database.

The system interactions and component interactions within DARS demonstrate how users can register, search for addresses, contribute address information, and authenticate themselves within the system. The front-end user interface component provides a visually appealing and user-friendly interface, while the back-end address management system component handles the storage, retrieval, and update of address information.

The user interface of DARS is designed to be user-friendly and intuitive, providing a seamless experience for users to interact with the system and access address-related information efficiently. It includes components such as the home page, registration and login functionalities, interactive maps, and search features.

The Digital Address Registration System (DARS) aims to modernize and improve address management in Ethiopia by leveraging digital technologies. It has the potential to enhance efficiency, accuracy, and accessibility in addressing systems, benefiting individuals, organizations, and government entities alike.

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