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COVID CATCHERS
FINDMYCOVID

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REVISION HISTORY

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1 INTRODUCTION

The global impact of the COVID-19 pandemic has underscored the critical need for real-time, accurate, and accessible data to understand its spread and impact. Our project aims to address this need by developing a comprehensive website that provides real-time mapping of COVID-19 cases worldwide. This platform will serve as a valuable resource for individuals, healthcare professionals, policymakers, and researchers seeking up-to-date information on the pandemic's status across geographical regions.

The core concept of our project revolves around the integration of two vital components: real-time COVID-19 data retrieval and visualization through an interactive map interface. Leveraging APIs for both COVID-19 data and mapping services, our platform will dynamically gather the latest statistics and display them visually on an intuitive map interface. Users will have the ability to explore COVID-19 case trends, distribution, and related data with ease, fostering a deeper understanding of the pandemic's impact on a global and local scale.

The scope of our project encompasses the development of a user-friendly website accessible across various devices. This platform will utilize APIs to fetch real-time COVID-19 data, ensuring accuracy and timeliness in information presentation. The map interface will provide interactive features, allowing users to zoom in/out, filter data by region, view detailed statistics, and track historical trends. The primary focus will be on delivering a seamless user experience, providing informative visualizations, and ensuring the reliability of the displayed information.
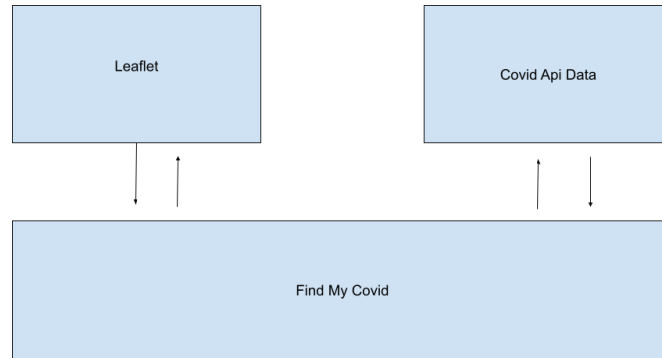
2 SYSTEM OVERVIEW

Figure 1: A simple architectural layer diagram

2.1 LEAFTLET LAYER DESCRIPTION

FEATURES

1. Map Display API: Provides functionalities to render interactive maps on the user interface.

2. Marker Creation: Generates markers based on data provided, adhering to specified filtering settings.

3. Integration with COVID API: Receives data from the COVID API for dynamic marker creation.

FUNCTIONS

1. Map Rendering: Utilizes Leaflet as the mapping library to display interactive maps.

2. Marker Generation: Creates markers on the map based on data received from the COVID API.

3. Data Integration: Accepts formatted COVID-19 data and integrates it into the map for display.

CRITICAL INTERFACES

1. COVID API Data Layer: Interacts with the COVID API Data Layer to receive filtered and formatted data.

2. Presentation Layer: Communicates with the Presentation Layer to display the map with markers.

INTERACTIONS

1. Upstream Components: Receives filtered COVID data from the COVID API Data Layer.

2. Downstream Components: Passes the map with markers to the Presentation Layer for display.

SERVICES PROVIDED

1. Map Rendering Service: Provides APIs for rendering interactive maps on the user interface.

2. Marker Creation Service: Generates markers based on COVID-19 data and specified filtering settings.

3. Data Integration Service: Accepts and integrates COVID-19 data into the map for display.

CONVENTIONS

1. Naming Conventions: Follows clear and consistent naming for components (e.g., prefix "Leaflet_-").

2. Data Flow Specification: Clearly defines the flow of data from the COVID API Data Layer to map rendering.

3. Filtering Settings: Adheres to specific conventions for handling filtering settings received for marker creation.

2.2 COVID API DATA LAYER DESCRIPTION

FEATURES

1. Data Retrieval: Fetches COVID-19 data from external APIs.

2. Data Formatting: Formats raw data into a structured format suitable for visualization.

3. Severity Classification: Categorizes data based on severity levels for mapping.

FUNCTIONS

1. API Communication: Establishes communication with external COVID APIs.

2. Data Parsing: Parses retrieved data, extracting relevant information.

3. Formatting for Leaflet API: Converts parsed data into a format compatible with Leaflet.

4. Severity Classification Logic: Implements algorithms for severity classification.

CRITICAL INTERFACES

1. External COVID APIs: Interfaces with external APIs, maintaining compatibility.

2. Leaflet API: Interfaces with Leaflet library for map integration.

INTERACTIONS

1. Upstream Components: Receives requests from application components for data retrieval.

2. Downstream Components: Passes formatted data to the Presentation Layer.

SERVICES PROVIDED

1. Data Retrieval Service: Fetches current COVID-19 data from external APIs.

2. Data Formatting Service: Structures raw data into a standardized format.

3. Severity Classification Service: Determines severity levels based on predefined criteria.

CONVENTIONS

1. Naming Conventions: Follows consistent naming for clarity (e.g., prefix "Data_").

2. Data Flow Specification: Clearly defines the flow of data from API retrieval to severity classification.

3. Error Handling: Implements robust error handling mechanisms for API and data-related issues.

FIND MY COVID LAYER

FEATURES

1. Map Display: Presents an interactive map to the user for visualizing COVID-19 data.

2. Marker and Layer Creation: Utilizes Leaflet to generate markers and layers based on COVID data.

3. External API Interaction: Retrieves real-time COVID-19 data from external APIs.

FUNCTIONS

1. Map Rendering: Displays an interactive map using the Leaflet library.

2. Marker and Layer Generation: Utilizes Leaflet functionality to create markers and layers.

3. Data Retrieval: Communicates with the COVID API Data Layer to obtain up-to-date information.

CRITICAL INTERFACES

1. COVID API Data Layer: Interacts with the COVID API Data Layer to receive formatted data.

2. Leaflet API: Interfaces with Leaflet library for map rendering and marker/layer creation.

INTERACTIONS

1. Upstream Components: Receives formatted COVID data from the COVID API Data Layer.

2. Downstream Components: Passes user interactions and map display to the Presentation Layer.

SERVICES PROVIDED

1. Map Rendering Service: Displays an interactive map on the user interface.

2. Marker and Layer Creation Service: Generates markers and layers based on COVID-19 data.

3. Data Retrieval Service: Interacts with the COVID API Data Layer to obtain updated COVID-19 information.

CONVENTIONS

1. Naming Conventions: Utilizes clear and consistent naming for components (e.g., prefix "Map_").

2. Data Flow Specification: Clearly defines the flow of data from the COVID API Data Layer to map rendering.

3. Error Handling: Implements robust error handling for potential issues related to data retrieval and map rendering.

3 SUBSYSTEM DEFINITIONS & DATA FLOW

The following diagram outlines the logical subsystems embedded within the layered architecture of the system. Each layer is composed of distinct subsystems that collectively facilitate the flow and processing of data essential for the representation of COVID-19 information on the mapping interface. The interactions/interfaces between these subsystems delineate the flow of data, ensuring the accurate visualization and display of COVID-19-related data across geographical regions.
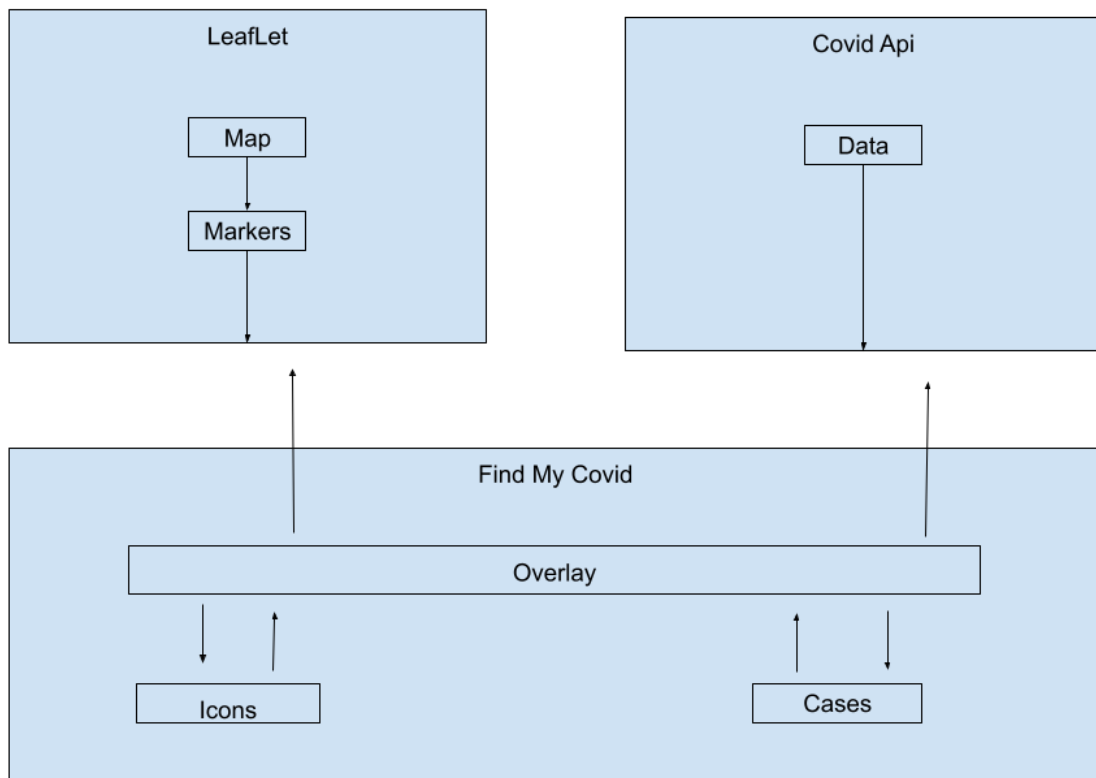

Figure 2: A simple data flow diagram

4 LEAFLET SUBSYSTEM

In this section, the leaflet layer organizes and produces the interactive mapping for the COVID-19 data. The leaflet layer comprises the mapping layer and the data markers for that map.

4.1 MAP SUBSYSTEM

The map layer of the leaflet subsystem deals with the general mapping for the COVID-19 data. It is restricted to the map of the United States and allows the user to zoom into individual states or counties. This subsystem communicates with the data marker subsystems in the leaflet layer.
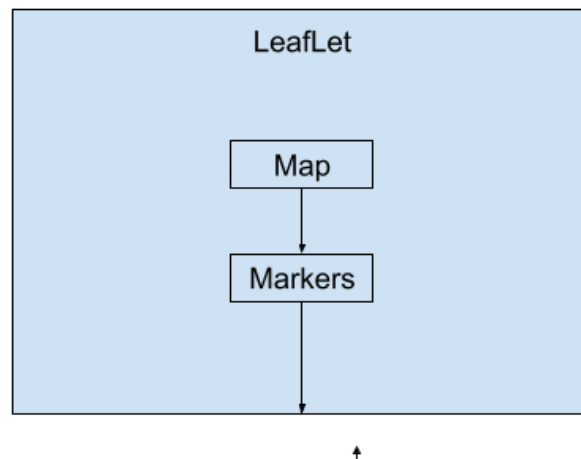

Figure 3: The Map and Marker Subsystem in the Leaflet Layer

4.1.1 ASSUMPTIONS

Geographical Data: The geographical data used to build the map is 100% accurate.
Device and Browser Compatibility: Another assumption is that the user is on a compatible device and browser to access the map and its functionalities. Lastly, the user should have a basic understanding of the United States map.

4.1.2 RESPONSIBILITIES

Map Retrieval: The Map subsystem is responsible for providing the map to display the COVID-19 data. The map should be an accurate display of the United States

Map Interaction: The Map should be interactive for the user and allow the user to zoom in and zoom out. This feature should give the user the freedom to locate more accurate locations in certain states and counties.

Integration with COVID-19 Data: Integrate the map with the external COVID-19 data to display on the map.

4.1.3 SUBSYSTEM INTERFACES

Table 2: Subsystem interfaces

ID	Description	Inputs	Outputs
#1	Map Display	N/A	Marker

4.2 DATA MARKERS SUBSYSTEM

The data marker section is responsible for generating markers on the map based on the data provided. The marker adheres to specified filtering settings such as time and severity.

4.2.1 ASSUMPTIONS

Data Format Consistency: Another assumption is that the data format is consistent for each marker.

Location Data Accuracy: An assumption for this subsystem is the accuracy of the provided location for each marker.

Distinguish Color Contrast: Users should be able to distinguish the differing colors on the map which indicates the cases of COVID-19 in the United States.

4.2.2 RESPONSIBILITIES

Information Display: Provide relevant information about each data point when a marker is clicked or hovered over. This includes the amount of COVID-19 cases in each region or location.

Filtering: Allow users to filter data markers based on specific criteria, helping them focus on the information that is most relevant to their needs.

Location Accuracy: Ensure that the data markers accurately represent the geographical locations of the associated data points. Location precision is crucial for the reliability of the information.

4.2.3 SUBSYSTEM INTERFACES

Table 3: Subsystem interfaces

ID	Description	Inputs	Outputs
#2	Marker Display on Map	NA	FindMyCovid Overlay
#3	Required Map Input	Map subsystem	NA

5   Covid Api Layer Subsystems

The COVID-19 API layer forms the backbone of the system, responsible for sourcing real-time pandemic data.

5.1   COVID Data Subsystem

The 'Data' subsystem within this layer functions as the core unit, facilitating the retrieval and processing of crucial COVID-19 statistics necessary for the system's mapping interface. Its pivotal role lies in ensuring the availability of accurate and up-to-date information, essential for informing users about the global pandemic landscape.
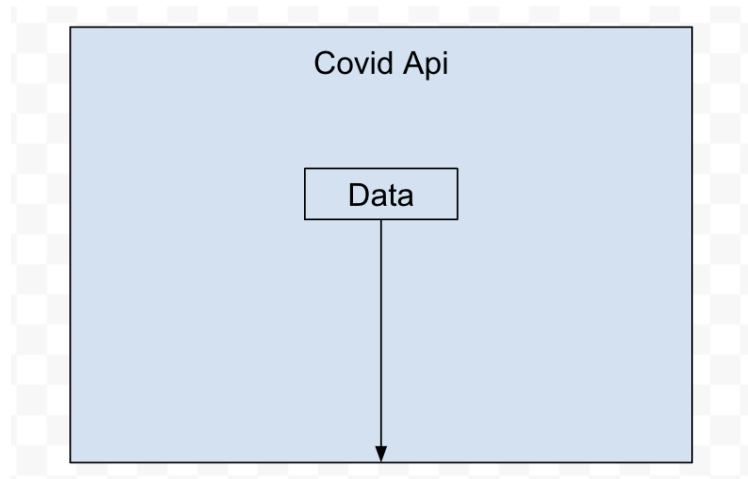
Figure 4: COVID data subsystem in the COVID API Layer

5.1.1   Assumptions

Data Format Consistency: The assumption is that the external COVID-19 data sources provide consistent data formats and structures. The 'Data' subsystem anticipates receiving standardized data types (such as JSON or CSV) to streamline the processing and integration into the mapping interface.

    API Availability: It's assumed that the external APIs providing COVID-19 data maintain consistent availability and uptime. This assumption ensures continuous data retrieval and minimizes potential interruptions in providing real-time statistics to the mapping system.

    Data Integrity and Accuracy: It's assumed that the data received from external sources is accurate and updated. The 'Data' subsystem relies on the assumption of reliable information to ensure the correctness of displayed COVID-19 statistics on the mapping interface.

    Compatibility with Mapping Interface: The 'Data' subsystem assumes compatibility with the mapping interface components in terms of data structures and formats. This compatibility assumption ensures smooth data flow and presentation within the mapping system without requiring extensive transformations.

5.1.2   Responsibilities

Data Retrieval: Access designated external COVID-19 data APIs to fetch real-time statistics, ensuring continuous and secure data retrieval. Establish reliable connections and periodically retrieve updated information on case counts, deaths, recoveries, testing rates, etc.

    Data Processing and Formatting: Validate incoming data for accuracy, consistency, and completeness. Cleanse, standardize, and format the received data into a consistent structure compatible with the

mapping interface.

Data Storage and Management: Maintain a structured repository to temporarily store and manage retrieved COVID-19 data. Implement efficient data management protocols for organizing and updating stored information.

Data Aggregation for Visualization: Aggregate and categorize COVID-19 statistics based on geographical regions (countries, states, etc.) for easy integration into the mapping interface. Format data for seamless visualization, ensuring accurate and meaningful representations.

5.1.3 SUBSYSTEM INTERFACES

The "Data Subsystem" serves as the backbone of the COVID API Data Layer, orchestrating the retrieval and processing of critical COVID-19 statistics. It interfaces with external COVID APIs through the API Communication Module, receiving raw data and authentication credentials. This raw data undergoes meticulous parsing and formatting in the Data Formatting Module, ensuring consistency and adherence to predefined structures. The formatted data then flows into the Severity Classification Module, where algorithms assess severity levels based on defined criteria. Once classified, the data is handed over to the Data Integration Service, responsible for packaging it into a standardized format suitable for downstream components. This packaged data includes comprehensive information about the severity of COVID-19 cases. Finally, the Presentation Layer receives this data, transforming it into an interactive map with markers that visually represents the current pandemic landscape. The seamless flow of information through these interfaces ensures the availability of accurate and up-to-date data, crucial for informing users and providing a comprehensive view of the global COVID-19 situation.

Table 4: Subsystem Interfaces

ID	Description	Inputs	Outputs
#1	API Communication Module	HTTP requests API authentication credentials	Raw COVID-19 data API response status
#2	Data Formatting Module	Raw COVID-19 data	Parsed and formatted COVID-19 data
#3	Severity Classification Module	Formatted COVID-19 data	Severity classified COVID-19 data
#4	Data Integration Service	Severity classified COVID-19 data	Packaged data for downstream components
#5	Presentation Layer	Packaged data for downstream components	Displayed map with markers based on COVID-19 data

6 Z LAYER SUBSYSTEMS

6.1 LEAFLET SUBSYSTEM

6.1.1 MAP SUBSYSTEM (SUBSYSTEM 1)

This section provides a general description of the Map Subsystem, which deals with the general mapping for COVID-19 data. It interacts with the Data Markers Subsystem and assumes the accuracy of geographical data and device/browser compatibility.
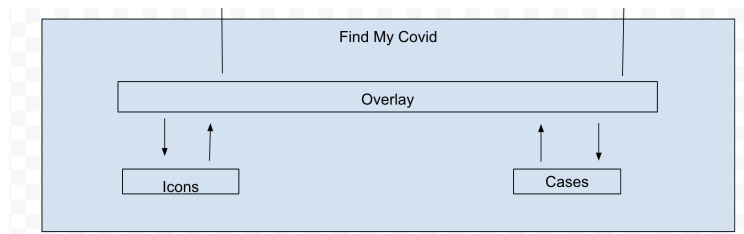

Figure 5: Example subsystem description diagram

6.1.2 ASSUMPTIONS

- **Geographical Data:** The geographical data used to build the map is assumed to be 100% accurate.

- **Device and Browser Compatibility:** Users are expected to be on a compatible device and browser to access the map and its functionalities.

- **User Knowledge:** Users should have a basic understanding of the United States map.

6.1.3 RESPONSIBILITIES

1. **Map Retrieval:** Provide an accurate display of the United States map.

2. **Map Interaction:** Enable user interaction with zoom in/out functionalities.

3. **Integration with COVID-19 Data:** Integrate the map with external COVID-19 data for display.

6.1.4 SUBSYSTEM INTERFACES

ID	Description	Inputs/Outputs
#1	Map Display	N/A / Marker

Table 5: Map Subsystem Interfaces

6.1.5 DATA MARKERS SUBSYSTEM (SUBSYSTEM 2)

This section describes the Data Markers Subsystem, which generates markers on the map based on COVID-19 data and follows specified filtering settings.

6.1.6 ASSUMPTIONS

- **Data Format Consistency:** The data format is assumed to be consistent for each marker.

- **Location Data Accuracy:** Provided location data for each marker is assumed to be accurate.

- **Distinguish Color Contrast:** Users can distinguish different colors on the map indicating COVID-19 cases.

6.1.7 RESPONSIBILITIES

1. **Information Display:** Provide relevant information about each data point when a marker is clicked or hovered over.

2. **Filtering:** Allow users to filter data markers based on specific criteria.

3. **Location Accuracy:** Ensure accurate representation of geographical locations for data points.

6.1.8 SUBSYSTEM INTERFACES

ID	Description	Inputs/Outputs
#2	Marker Display on Map	N/A / FindMyCovid Overlay
#3	Required Map Input	Map Subsystem / N/A

Table 6: Data Markers Subsystem Interfaces

REFERENCES