

## Solution Architecture

### 1. Overview

The solution architecture describes how different components of the system interact to analyze heart disease data and present insights through interactive dashboards integrated with a web application.

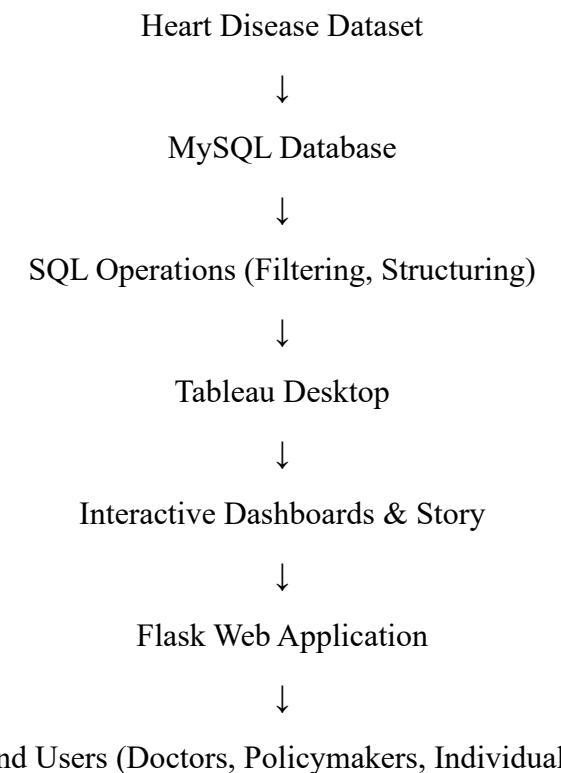
The system follows a **Data-to-Visualization-to-Web Deployment architecture** consisting of:

- Data Source Layer
- Database Layer
- Data Processing Layer
- Visualization Layer
- Web Integration Layer
- End User Layer

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### 2. Architecture Diagram (Conceptual Representation)

You can draw this structure in your document:



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### 3. Architecture Components Explanation

#### 3.1 Data Source Layer

- The heart disease dataset is collected from a validated source.
- The dataset includes attributes such as Age, Gender, BMI, Smoking, Diabetes, Stroke, etc.

- Data is pre-cleaned before storage.
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### **3.2 Database Layer (MySQL)**

- The dataset is stored in a structured MySQL database.
- Tables are created with appropriate data types.
- Data integrity is validated using MySQL Workbench.
- SQL queries are used for filtering and structuring data.

Functions:

- Data storage
  - Query execution
  - Performance monitoring
  - Row count verification
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### **3.3 Data Processing Layer (SQL Operations)**

- Filtering unnecessary fields
- Structuring dataset for analysis
- Validating data accuracy
- Preparing data for Tableau connection

Example operations:

- SELECT queries
  - WHERE conditions
  - GROUP BY analysis
  - Aggregations
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### **3.4 Visualization Layer (Tableau)**

- MySQL database is connected to Tableau.
- 8–10 unique visualizations are created.
- Interactive filters applied.
- Responsive dashboard designed.
- Storyboard created to explain insights step-by-step.

Visualization Types:

- Bar charts
- Scatter plots

- Heat maps
  - Comparative graphs
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### **3.5 Web Integration Layer (Flask)**

- Tableau dashboards are published.
  - Embedded into Flask web application.
  - Provides browser-based access.
  - Ensures user-friendly interface.
  - Allows interactive dashboard exploration.
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### **3.6 End User Layer**

Users of the system:

1. Doctors – Identify high-risk patients.
  2. Policymakers – Plan preventive strategies.
  3. Individuals – Monitor personal health risks.
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## **4. Architecture Type**

The system follows a **Three-Tier Architecture Model**:

1. Presentation Layer – Flask Web Application
2. Application Layer – Tableau Dashboard
3. Data Layer – MySQL Database

This ensures:

- Separation of concerns
  - Scalability
  - Easy maintenance
  - Secure data access
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## **5. Data Flow Explanation**

1. Dataset is collected and stored in MySQL.
2. SQL operations prepare the dataset.
3. Tableau connects to MySQL for visualization.
4. Dashboards and stories are created.
5. Dashboards are embedded into Flask.

6. End users access dashboards through web browser.

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## 6. Advantages of This Architecture

- Modular design
- Scalable system
- Secure database connection
- Interactive visualization
- Web-based accessibility
- Easy future integration of AI/ML models