

Project Design Phase Solution Architecture

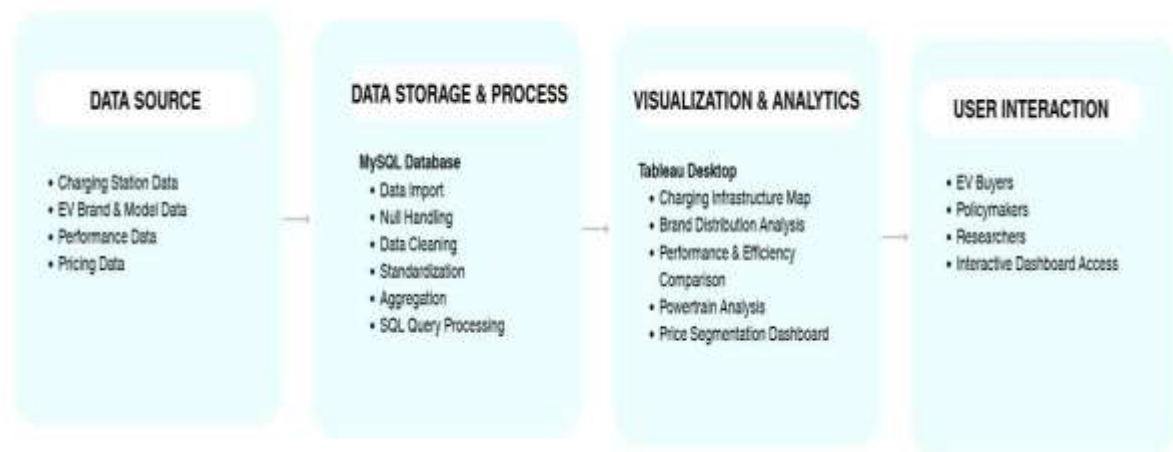
Date	15 February 2025
Team ID	LTVIP2026TMIDS47424
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	4 Marks

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:



Architecture Description

The proposed system follows a structured four-layer data analytics architecture designed to convert fragmented electric vehicle datasets into interactive and meaningful insights. The architecture ensures efficient data processing, structured storage, and dynamic visualization using SQL and Tableau.

1. Data Source Layer

The Data Source Layer consists of multiple EV-related datasets stored in CSV format. These datasets include:

- Charging station infrastructure data
- EV brand and model specifications
- Performance attributes (range, speed, efficiency)
- Pricing information

These datasets represent raw, unstructured data collected from various sources.

2. Data Storage & Processing Layer

The raw datasets are imported into a MySQL database where structured data management is performed.

Key processing operations include:

- Handling missing values
- Removing inconsistencies
- Standardizing brand and model names
- Aggregating charging station counts by region
- Calculating performance averages
- Structuring pricing segments

SQL queries ensure efficient transformation of raw data into analysis-ready datasets.

3. Visualization & Analytics Layer

Tableau Desktop connects directly to the MySQL database.

This layer performs:

- Interactive dashboard creation
- Map visualization for charging infrastructure
- Brand & body style distribution analysis
- Performance & efficiency comparison
- Powertrain segmentation
- Price comparison charts

Filters and dynamic parameters allow real-time interaction.

4. User Interaction Layer

End users interact with the Tableau dashboard to:

- Explore EV market trends
- Compare vehicle brands
- Analyze infrastructure distribution
- Evaluate pricing structures

The system supports decision-making for consumers, analysts, and policymakers

5. Web Application Layer

The processed Tableau dashboards are embedded into a Flask-based web application.

This layer includes:

- Python Flask backend server
- HTML & Bootstrap-based responsive UI
- Tableau JavaScript API embedding
- Navigation interface (Home, About, Dashboard, Story, Contact)

This enables browser-based access to dashboards through a structured web interface.

Data Flow Process

1. Raw EV datasets are collected and stored as CSV files.
2. Data is imported into MySQL database.
3. SQL queries clean, aggregate, and transform the data.
4. Tableau connects to MySQL and fetches processed datasets.
5. Dashboards are generated for interactive analysis.
6. End users access insights via Tableau dashboards.
7. Tableau dashboards are embedded into Flask web application.
8. End users access dashboards through web browser interface.