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Completed the project named as Phase 2 - Solution Design & Architecture

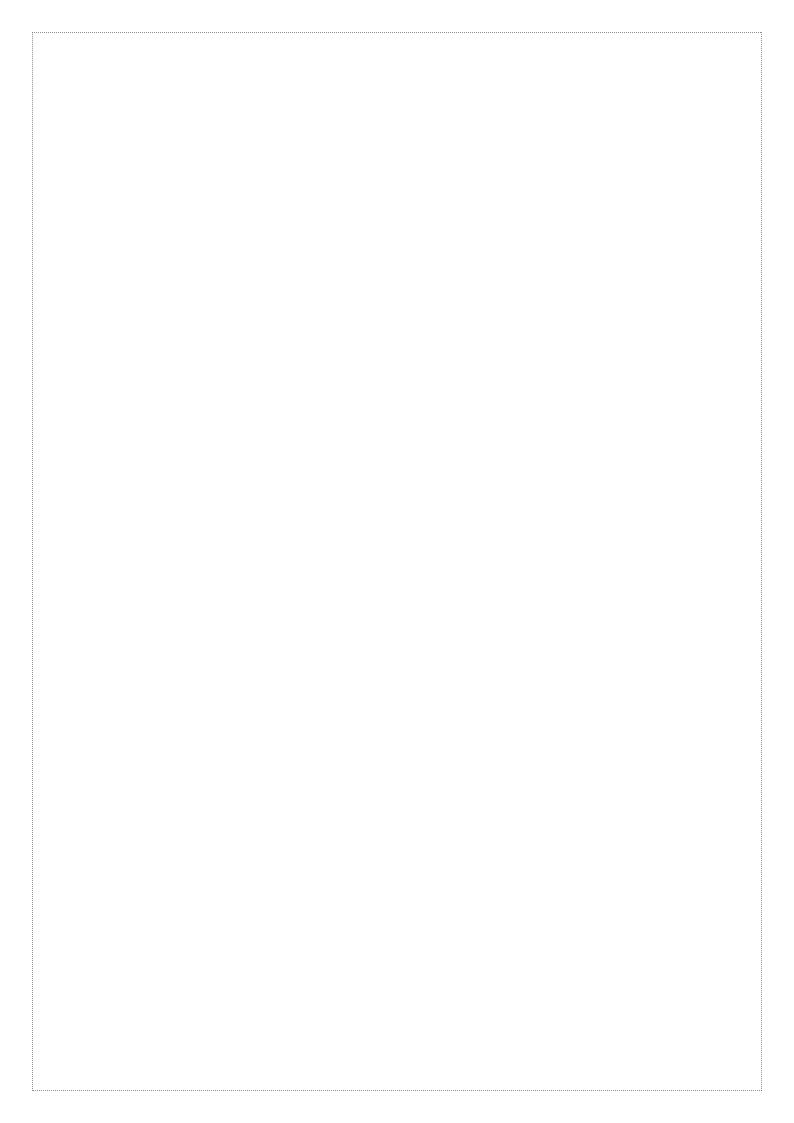
FRONT END TECHNOLOGY

**PROJECT NAME:** LIVE WEATHER DASHBOARD

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# **LIVE WEATHER DASHBOARD**

### 1. Tech Stack Selection

To build a scalable and responsive live weather dashboard, the following technologies are selected:

#### **Frontend**

React.js for component-based UI

Tailwind CSS or Bootstrap for styling

Axios for API calls

#### **Backend**

Node.js with Express for RESTful API

Python with FastAPI (alternative for data-heavy processing)

## **API Integration**

OpenWeatherMap or WeatherAPI for real-time weather data

GeoLocation API for user-based location detection

#### **Database**

MongoDB for storing user preferences and logs

Redis for caching frequent weather queries

# **Hosting & Deployment**

Vercel or Netlify for frontend

Heroku or AWS EC2 for backend services

# **DevOps & Monitoring**

GitHub Actions for CI/CD

Docker for containerization

Prometheus + Grafana for performance monitoring

# 2. UI Structure & API Schema Design

#### **UI Structure**

The dashboard is divided into intuitive sections:

**Header**: Contains app name, search bar, and location toggle

Main Panel: Displays current weather, temperature, humidity, wind speed

**Forecast Section**: Hourly and 7-day forecast with icons

**Sidebar Widgets**: Favorite locations, alerts, and settings

**Footer**: Credits, API source, and contact info

## **API Schema Design**

Endpoint: GET /weather?location={city}

## **Some Endpoints:**

GET /forecast?location={city}

POST /favorites

GET /alerts?location={city}

# 3. Data Handling Approach

Efficient data handling ensures performance and reliability:

## **Fetching Strategy**

Real-time data fetched using scheduled polling

Webhooks for alert updates (if supported by API provider)

# **Caching**

Redis used to cache frequent queries

TTL (Time to Live) set based on forecast freshness

#### Storage

MongoDB stores user preferences, search history, and logs

Weather logs used for analytics and trends

#### **Error Handling**

Retry mechanism for failed API calls

Fallback to cached data during API downtime

Graceful UI degradation with user notifications

#### **Security Measures**

API key encryption and rotation

HTTPS for secure data transmission

Input validation and rate limiting

# 4. Component / Module Diagram

# **Frontend Components**

**SearchBar:** Input for city/location

WeatherDisplay: Shows current weather

**ForecastPanel:** Hourly and daily forecast

**MapWidget:** Optional weather map integration

**SettingsPanel:** Theme, units, and preferences

#### **Backend Modules**

WeatherController: Handles API requests

ForecastService: Processes forecast data

APIClient: Communicates with external weather APIs

CacheManager: Manages Redis caching

UserPreferencesService: Stores and retrieves user settings

#### **Database Collections**

Users: Stores user profiles and preferences

Locations: Saved locations and search history

WeatherLogs: Historical weather data

# 5. Basic Flow Diagram

The flow of data and interaction is as follows:

#### Code

# Explanation

User enters a location in the UI

