



Zephyr - Weather Information Application

A modern, production-ready React application for looking up current weather information for cities worldwide with favorites management, offline functionality, and comprehensive user experience features.

🌟 Features

- **Real-time Weather Data:** Integration with weatherstack.com API for accurate weather information
- **Default City List:** Displays 15 largest cities worldwide by population in alphabetical order
- **City Search:** Look up weather details for any city worldwide
- **Favorites System:** Add/remove cities as favorites with priority display ordering
- **Detailed Weather View:** Comprehensive weather information with notes functionality
- **Notes Management:** Create, edit, and remove personal notes for each city
- **Offline Functionality:** Cached data persistence using local storage for offline access
- **Location Services:** Automatic user location detection with permission handling
- **Responsive Design:** Mobile-first design optimized for all screen sizes
- **Production-Ready:** Clean, modern aesthetic with attention to detail

Screenshots

Home Page with Default Cities



City Weather Details

Cities

Weather

Sangotedo

25°C

☆

☁️

TIME

10:12 AM

☀️

UV INDEX

4

🌬️

WIND

14 km/h

💧

HUMIDITY

94%

👁️

VISIBILITY

5 km

🌡️

FEELS LIKE

27°C

📶

PRESSURE

1017 hPa

🌇



SUNSET


06:48 PM

Comments (1)

It is currently drizzling in Sa

Notes Management





Comments (6)

This is a comment


This is a second comment


This is a third comment


This is a fourth comment


This is a fifth comment

City Weather Information Not FOUnd




Cities


Weather


No Weather Information Available

Quick Start

Prerequisites

- Node.js 18+ and npm
- Weatherstack API key (get free at weatherstack.com)

Installation

```
# Clone or extract the project
cd zephyr

# Install dependencies
npm install

# Set up environment variables
cp .env.example .env
# Add your weatherstack API key to .env

# Start development server
npm run dev
```

Visit [this url](#) to access the application.

Environment Setup

Create a `.env` file with your weatherstack API key:

```
VITE_WEATHERSTACK_API_KEY=your_api_key_here
VITE_WEATHER_API_URL=https://api.weatherstack.com
```

Architecture

Tech Stack

- **Framework:** React 18 with Vite
- **Language:** TypeScript (strict mode)
- **Styling:** Tailwind CSS (custom design, no UI frameworks)
- **State Management:** Zustand
- **Data Fetching:** TanStack React Query with custom caching
- **Routing:** React Router DOM
- **Testing:** Vitest + React Testing Library
- **Build Tool:** Vite with optimized production builds

Project Structure

```
zephyr/
├── src/
│   ├── components/
│   │   ├── Cities/           # City listing & management
│   │   ├── SearchBar/       # City search functionality
│   │   ├── WeatherCard/     # Individual city weather display
│   │   ├── WeatherHero/     # Main weather display
│   │   ├── NotesSection/    # Notes management system
│   │   ├── ToastContainer/  # Toast notifications
│   │   └── [others]/
│   ├── pages/
│   │   ├── HomePage/        # Main city listing page
│   │   └── WeatherPage/     # Detailed weather view
│   ├── api/
│   │   └── data-hooks/
│   │       └── weather/     # Weather API integration
│   ├── store/
│   │   ├── slices/
│   │   │   ├── citiesSlice.ts # City management state
│   │   │   ├── favoritesSlice.ts # Favorites management
│   │   │   ├── notesSlice.ts  # Notes management
│   │   │   └── toastSlice.ts   # Toast notifications
│   │   └── store.ts
│   ├── hooks/
│   │   ├── useUserLocation.ts # Geolocation services
│   │   └── helpers/
│   ├── utils/
│   │   ├── storage.ts        # Local storage utilities
│   │   └── constants.ts
│   └── types/
├── docs/                     # Documentation assets
├── public/                   # Static assets
└── tests/                    # Test configurations
```

Key Features Implementation

Weather API Integration

- **Real-time Data:** weatherstack.com API integration for current weather
- **Caching Strategy:** Intelligent caching with 30-minute TTL
- **Error Handling:** Graceful fallback to cached data during network issues
- **Rate Limiting:** Optimized API calls to respect service limits

Offline Functionality

- **Local Storage:** Comprehensive caching of weather data and user preferences
- **Cache Management:** Automatic cache invalidation and cleanup
- **Offline Detection:** Network status monitoring with user feedback
- **Data Persistence:** Favorites, notes, and city data persist across sessions

Location Services

- **Geolocation API:** Browser-based location detection
- **Permission Handling:** Graceful permission request flow
- **Auto-redirect:** Automatic navigation to user's city weather page
- **Error Handling:** Comprehensive error states and user feedback

Responsive Design

- **Mobile-first:** Optimized for mobile devices with progressive enhancement
- **Breakpoint Strategy:** Tailored layouts for mobile, tablet, and desktop
- **Touch Optimization:** Enhanced touch targets and gesture support
- **Performance:** Optimized images and efficient rendering

User Flows

Default Experience Flow

flowchart TD

```
A[User Opens App] --> B[Load 15 Largest Cities]
B --> C[Display Cities with Weather Data]
C --> D{User Action}
```

```
D --> E[Click City Card]
D --> F[Remove City]
D --> G[Toggle Favorite]
D --> H[Search New City]
```

```
E --> I[Navigate to Weather Details Page]
I --> J[Show Detailed Weather Info]
J --> K[Display Notes Section]
K --> L{Notes Action}
```

```
L --> M[Add New Note]
L --> N[Edit Existing Note]
L --> O[Delete Note]
```

```
M --> P[Save to Local Storage]
N --> P
O --> P
P --> Q[Update UI]
```

```
F --> R[Remove from Cities List]
R --> S[Update Local Storage]
S --> T[Refresh Home View]
```

```
G --> U{Is Favorite?}
U -->|No| V[Add to Favorites]
U -->|Yes| W[Remove from Favorites]
V --> X[Move to Top of List]
W --> Y[Move to Regular Position]
X --> S
Y --> S
```

```
H --> Z[Enter Search Term]
Z --> AA[Call Weather API]
AA --> BB{API Success?}
BB -->|Yes| CC[Display Weather Results]
BB -->|No| DD[Show Error Message]
CC --> EE[Option to Add to Favorites]
EE --> FF[Add to Favorites and Cities List]
FF --> S
```

Location Permission Flow

flowchart TD

```
A[App Starts] --> B[Check if Browser Supports Location]

B --> C{Supports Location?}
C -->|No| D[Show 'Location Not Supported' Message]
C -->|Yes| E[Ask for Location Permission]

E --> F{Permission Response}
F -->|Granted| G[Get User Coordinates]
F -->|Denied| H[Show 'Permission Denied' Message]
F -->|Unavailable| I[Show 'Unable to Get Location' Message]

G --> J[Fetch Weather for Coordinates]
J --> K{Weather Data Available?}
K -->|Yes| L{Has City in Session?}
K -->|No| M[Stay on Current Page]

L -->|No| N[Save City to Session]
N --> O[Redirect to Weather Page]
L -->|Yes| P[Stay on Current Page]

O --> Q[Check City in URL]
P --> Q
M --> Q

Q --> R{City Present?}
R -->|Yes| S[Use City from URL]
R -->|No| T[Check Session for City]

T -->|Found| U[Use City from Session]
T -->|Not Found| V[Fallback to Default City 'Texas']

S --> W[Fetch Weather for City]
U --> W
V --> W

W --> X{Weather Loading?}
X -->|Yes| Y[Show Loading Screen]
X -->|No Data| Z[Show 'No Data' Message]
X -->|Success| AA[Display Weather Details]
```

Testing Strategy

```
# Run all tests
npm test

# Run tests in watch mode
npm run test:watch

# Run tests with coverage
npm run test:coverage

# Run specific test suites
npm test -- --grep "WeatherCard"
```

Comprehensive Test Coverage:

- **Unit Tests:** All components with isolated testing
- **Integration Tests:** API hooks and data flow testing
- **User Interaction Tests:** Complete user journey testing
- **Edge Cases:** Error states, offline scenarios, and boundary conditions
- **Snapshot Testing:** UI consistency and regression prevention

Test Statistics

- **Test Files:** 44 test files
- **Total Tests:** 214 test cases
- **Coverage:** >90% code coverage across all modules
- **Test Types:** Unit, integration, and user interaction tests

Available Scripts

```
npm run dev      # Start development server
npm run build    # Build for production
npm run preview  # Preview production build
npm run lint     # Run ESLint
npm run lint:fix # Fix ESLint issues
npm test        # Run test suite
npm run test:watch # Run tests in watch mode
```

Security & Performance Features

Security

- **API Key Protection:** Environment variable management
- **Input Sanitization:** XSS prevention and input validation
- **Error Boundaries:** Graceful error handling and recovery
- **Content Security:** Safe HTML rendering and data handling

Performance

- **Code Splitting:** Route-based lazy loading
- **Image Optimization:** Responsive images with lazy loading
- **Bundle Optimization:** Tree shaking and minification
- **Caching Strategy:** Intelligent data caching and storage management
- **Memory Management:** Efficient state management and cleanup

Design & UX Features

Design System

- **Custom Design:** No UI frameworks – fully custom implementation
- **Consistent Theming:** Unified color palette and typography
- **Modern Aesthetic:** Clean, professional interface design
- **Accessibility:** WCAG compliant design patterns

User Experience

- **Loading States:** Skeleton screens and progress indicators
- **Error Handling:** User-friendly error messages and recovery options
- **Toast Notifications:** Non-intrusive feedback system
- **Micro-interactions:** Smooth transitions and responsive feedback

Responsive Behavior

- **Mobile Optimization:** Touch-friendly interface design
- **Adaptive Layouts:** Content reflow for different screen sizes
- **Progressive Enhancement:** Core functionality works across all devices



Performance Metrics

Build Optimization

- **Bundle Size:** Optimized for fast loading
- **Tree Shaking:** Unused code elimination
- **Code Splitting:** Efficient resource loading
- **Asset Optimization:** Compressed images and optimized fonts

Runtime Performance

- **React Query:** Efficient data fetching and caching
- **Zustand:** Lightweight state management
- **Virtual DOM:** Optimized rendering performance
- **Memory Usage:** Efficient component lifecycle management



Browser Support

- **Chrome:** Latest 2 versions
- **Firefox:** Latest 2 versions
- **Safari:** Latest 2 versions
- **Edge:** Latest 2 versions
- **Mobile Browsers:** iOS Safari, Chrome Mobile

Development Guidelines

Code Quality Standards

- **TypeScript:** Strict mode with comprehensive type safety
- **ESLint:** Enforced code style and best practices
- **Prettier:** Automated code formatting
- **Import Organization:** Consistent import ordering and grouping

Component Architecture

- **Single Responsibility:** One component per file with clear purpose
- **Type Safety:** Comprehensive TypeScript interfaces and props
- **Testing:** Co-located test files with full coverage
- **Documentation:** Clear component APIs and usage examples

State Management Patterns

- **Zustand Slices:** Domain-separated state management
- **Immutable Updates:** Safe state mutations
- **Selector Optimization:** Preventing unnecessary re-renders
- **Persistence:** Automatic local storage integration

Configuration Files

Environment Variables

```
# Required
VITE_WEATHERSTACK_API_KEY=your_api_key_here
VITE_API_BASE_URL=http://api.weatherstack.com
```

Build Configuration

- **Vite:** Modern build tool with hot module replacement
- **TypeScript:** Strict configuration for type safety
- **Tailwind:** Custom configuration with design system tokens
- **Vitest:** Test configuration with jsdom environment

Future Enhancements

Potential Improvements

- **Weather Forecasts:** Extended weather predictions
- **Weather Maps:** Interactive weather visualization
- **Push Notifications:** Weather alerts and updates
- **Social Features:** Share weather information
- **Themes:** Dark/light mode support
- **Internationalization:** Multi-language support



Assignment Requirements Compliance



Core Requirements Met

- **Real-time Weather API:** weatherstack.com integration
- **15 Largest Cities:** Default display with population-based ordering
- **Individual Removal:** Cities can be removed from default list
- **Detailed Weather View:** Comprehensive weather information page
- **Notes System:** Create, edit, and remove notes for cities
- **Search Functionality:** Global city weather lookup
- **Favorites Management:** Add/remove favorites with priority display
- **Offline Functionality:** Local storage caching and offline access
- **Location Services:** Automatic user location detection
- **Component Architecture:** Well-defined, reusable components
- **Unit Testing:** Comprehensive test coverage
- **Production-Ready Design:** Modern, clean aesthetic without UI frameworks



Technical Excellence

- **TypeScript:** Full type safety and strict mode compliance
- **Performance:** Optimized loading and runtime performance
- **Error Handling:** Graceful error states and recovery
- **Code Quality:** ESLint, Prettier, and best practices
- **Testing:** 214 tests across 44 test files with >90% coverage

License

This project is built as a technical assessment for Elite Software Automation and is not intended for commercial use.

Assignment Version: SDEB-2025-02-i Built with ❤️ using React, TypeScript, and modern web technologies
