

Green Vault



Team Members: Giorgio Abboud, Malik Dagher, Audrey Gamero, Daniella Lacotera, Rodrigo Munoz

Team Lead/Product Owner: Giorgio Abboud

Instructor/Faculty: Dr. Masoud Sadjadi / Associate Professor, Florida International University



Problem Overview

- Traders receive their trade fills (the executed price of an order) but lack a clear, accessible way to evaluate whether the execution was favorable or inefficient.
- Everyday traders have no simple tools to assess key execution factors such as slippage, spreads, or timing quality.
- Current Professional Transaction Cost Analysis (TCA) systems are cost-prohibitive, overly complex, and designed for institutional use- leaving retail traders without practical alternatives.
- Beginner and intermediate traders are then left to operate without meaningful guidance on execution performance- limiting their ability to learn, adapt, and improve.

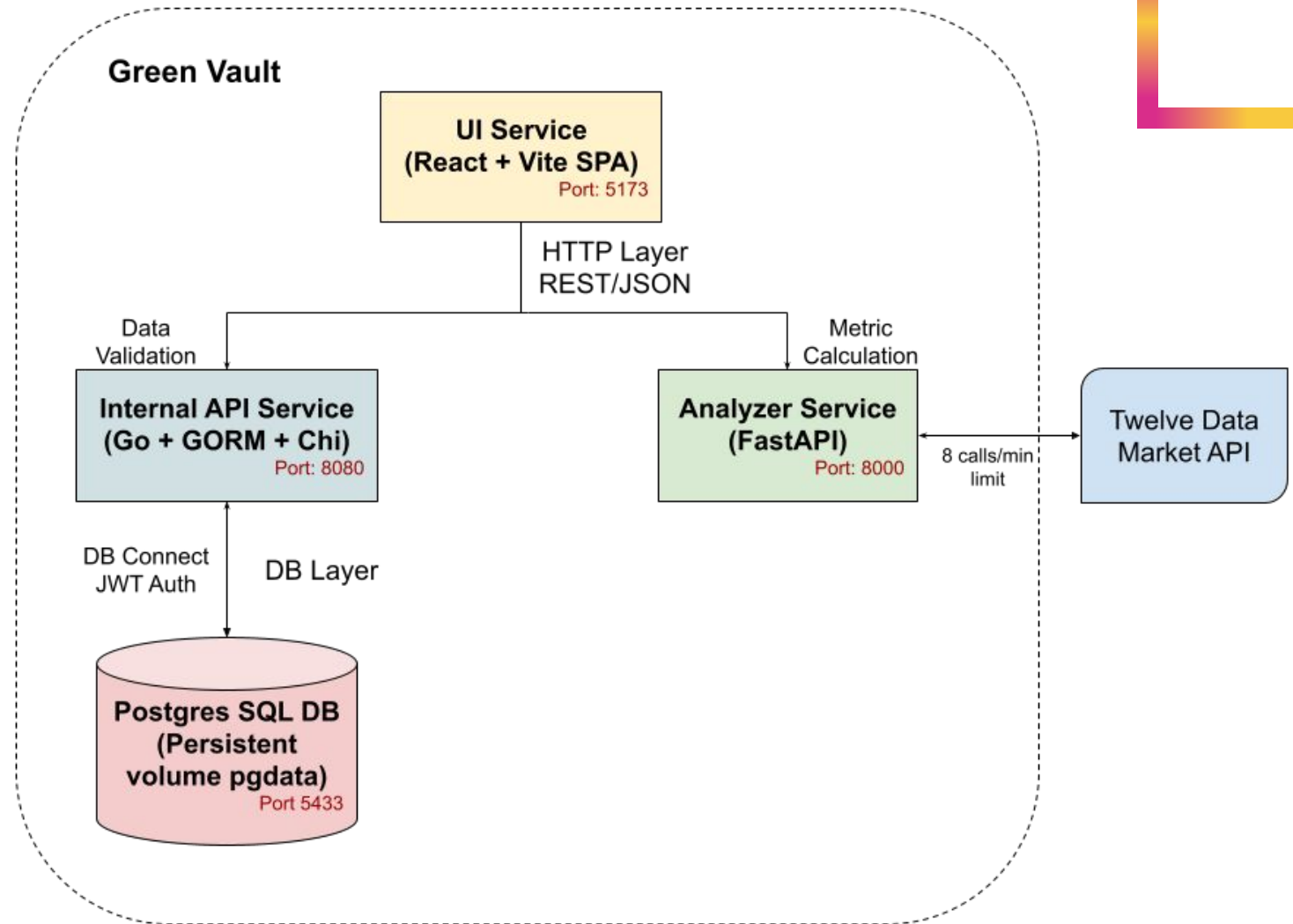


System Objective

- Provide traders with a clear, accessible evaluation of their trade execution quality.
- Convert complex market metrics into intuitive performance reviews that help users understand their performance.
- Deliver a fully integrated platform that securely manages user accounts, retrieves market data, performs metric calculations, and returns structured, interpretable analytics.
- Bridge the gap between institutional analytics and everyday traders through a simple, fast, and transparent system.

System Architecture

- Green Vault consists of four containerized services, including the **UI**, **Analyzer**, and **Internal API**, plus a **PostgreSQL database**, all orchestrated through Docker Compose.
- The **UI** serves as the system's entry point, communicating with the Analyzer for market calculations and with the Internal API for authentication and data persistence.
- The **Analyzer** computes hidden metrics, and uses them to evaluate the users performance, and returned a detailed response with advice to improve.
- Only the **Internal API** has direct access to the database, ensuring strong separation of concerns, secure data handling, and consistent deployment across environments.



Core Features

User Authentication & Account Management

- Secure signup, login, and session management using JWT-based authentication.



Sign up

Email
you@example.com

First name Last name
First name Last name

Password

Confirm password

Create account

Already have an account? [Log in](#)

Log in

Email
you@example.com

Password

Log in

Don't have an account? [Sign up](#)

Core Features

Trade Input & Validation

- Users submit a single trade; the system validates timestamps, symbols, and input formats.



Calculate

Date & time ?

mm/dd/yyyy, --:-- --



Price

e.g. 100.50

Quantity

e.g. 10

Side

Select side



Symbol ?

e.g. AAPL

[Supported symbols](#)

Analyze

Estimate

Mode: **Analyze**

Run

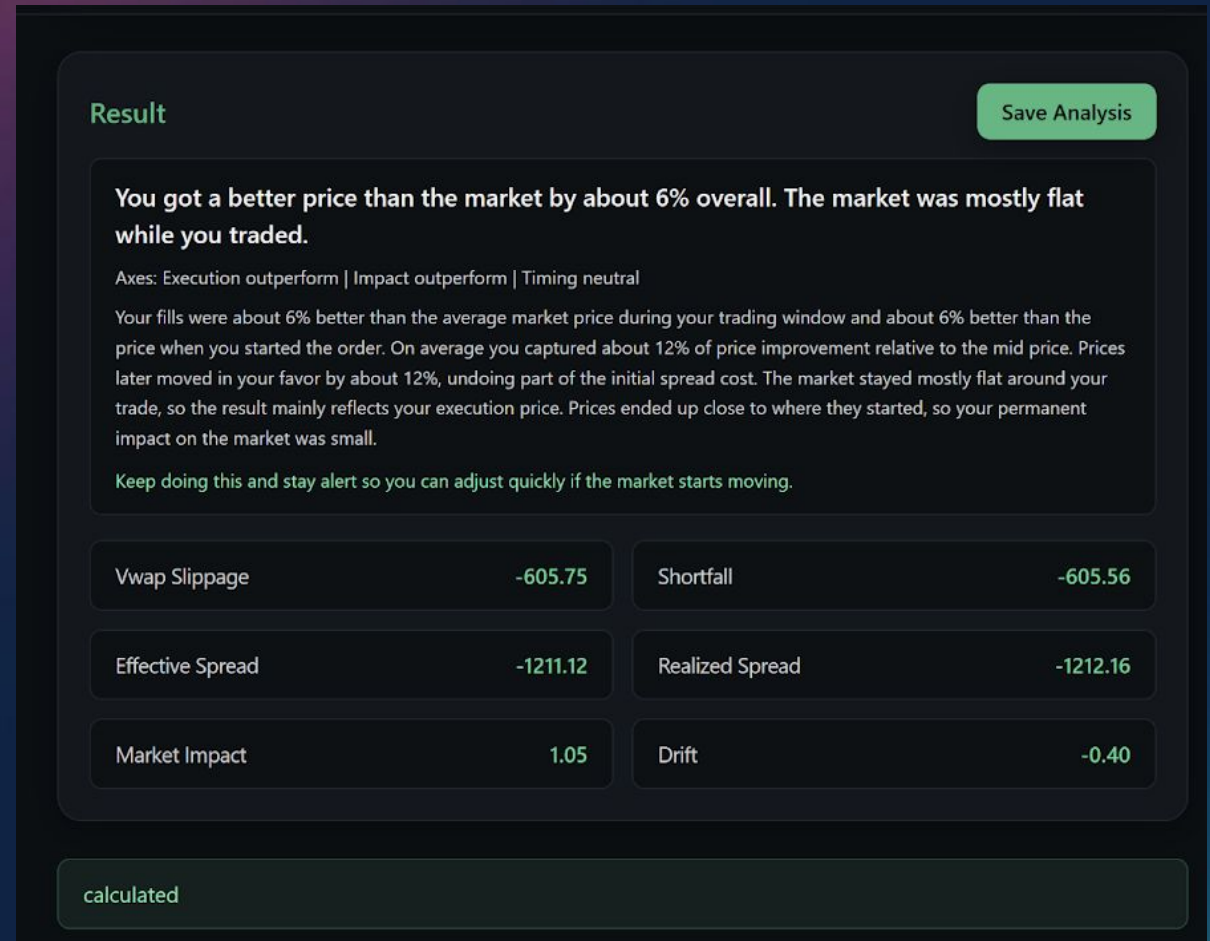
Core Features

Market Data Retrieval

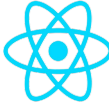
- Analyzer fetches 1-minute OHLCV bars from the Twelve Data API surrounding the trade time.

Execution Metrics Computation

- Calculates VWAP slippage, shortfall, effective and realized spreads, market impact, and drift.



Implementation Stack

- **Frontend:** React, Vite, TailwindCSS, React Router    
- **Analytics Service:** Python, FastAPI, Twelve Data API 
- **Internal Backend:** Go, Chi Router, GORM, JWT Authentication  
- **Database:** PostgreSQL with dockerized volume persistence 
- **Infrastructure:** Docker Compose, Chainguard base images, REST/JSON interfaces 
- **Testing:** pytest (Analyzer), Go testing framework (Internal API)



Future Improvements

- **Data Resilience:** Add retry/backoff logic, caching for recent OHLCV windows, and alternative data-provider support.
- **Authentication Hardening:** Enforce stronger JWT practices, add email verification, rate limiting, and secure cookie/HTTPS guidelines.
- **Time & Market Validations:** Introduce DST-aware market-hour validation and expand timestamp support.
- **Expanded Analytics:** Support multi-fill trades, longer windows, arrival-price benchmarks, and participation rate metrics.
- **UI Enhancements:** Provide clearer messaging for missing market data, add historical views, filters, and export options.
- **System Reliability:** Add structured logging, request tracing, metrics dashboards, and improved error observability.
- **Security & Compliance:** Strengthen environment variable management and add audit logging for saved trades.

Summary

- Green Vault delivers an accessible, structured solution for evaluating trade execution quality.
- The platform integrates secure authentication, validated data collection, API-based market retrieval, and detailed execution analytics.
- A modular architecture separates concerns across the UI, Analyzer, and Internal API, ensuring reliability and maintainability.
- Green Vault is a meaningful, user-centered tool that transforms complex trading analytics into clear, actionable insights for everyday traders.

Thank You!

