RothScope Design Presentation

CS495 Capstone Project 2025

Team and Client Information

The team:

- Gabe Manning
- Dustin Muse
- Jaydon Buckler
- Noah King
- Alli Carr

The client:

- Moneytree; a financial advising application provider

Client mentors:

- Alex Long- Product Lead
- Evan Knapke- Technical Mentor

Business Requirements

BR1 Optimal Roth Conversion Tool

Moneytree, as a financial advising application provider, has many useful tools for financial planning. However, they do not currently have a tool that calculates the optimal time and/or amount to convert tax-deferred retirement account funds into a Roth account. The goal is to use variables such as income, yearly spending, and retirement age alongside the Moneytree calculation engine to create a model that maximizes total ending assets and/or minimizes cumulative taxes. This tool can then be used to formulate future financial strategies for users of Moneytree. A database will also be associated with this tool that allows for easy retrieval of client data and storage of outcomes for future planning. Having this tool implemented into software would expand Moneytree's market space and usefulness to clients who use their platform.

Use Cases - Actors

Existing Moneytree Software and Calculation Engine

- The existing software is where the new tool for Roth optimization will be housed and utilized by clients.
- The Moneytree calculation engine is implemented into the tool to provide functionality.

The Roth Optimization Tool

- The software that will be created to satisfy BR1.
- This is what will be used by the target audience for financial planning.

Moneytree

- Who the tool is being built for; the company has stake in the implementation and functionality.
- Controls what gets put into the tool, what users can do with it, and how users get access.

Financial Advisors/Planners

- A professional user who will utilize the tool to assist clients with financial and retirement planning.
- The main target audience

Independent Users

- Those who use this tool without professional assistance to try to plan their own finanical future.
- A secondary target audience

Use Cases

UC1 - Running Tool for Optimal Roth Conversion

- This is the main use of this new tool; users input/load their data into the tool and select a desired optimization strategy in order to gain insight on how to achieve the optimal financial outcomes.
- Actors: The Roth Optimization Tool, Financial Advisors/Planner, Independent Users
- Flow: Open application, input/load information, set desired optimization strategy, run calculation

UC2 - Inputting/Changing Data

- Users will need to change/input their information that is stored in the database if their circumstances change or they are a new user. Different data means different outcomes, so having an avenue to do this is vital.
- Actors: The Roth Optimization Tool, Financial Advisors/Planner, Independent Users
- Flow: Open application, input new user information or change existing data

UC3 - Comparing Different Scenarios

- Users may want to compare outcomes when inputting different data as the input variables or by selecting various desired optimization strategies to see potential discrepancies. They will use this gained information to make decisions regarding their financial future.
- Actors: The Roth Optimization Tool, Financial Advisors/Planner, Independent Users
- Flow: Open application, input/load information, set desired optimization strategy, run calculation, repeat with new information, inspect differences, make decisions on how to proceed.

UC4 - Exporting Calculation Outcomes

- Users will want to export reports containing the results of their calculations. These reports can be utilized for record-keeping, presentation, or additional financial planning. Financial advisors/planners will use this tool to maintain financial strategies for multiple clients at a time without needing to run calculations every time they need information.
- Actors: The Roth Optimization Tool, Financial Advisors/Planner, Independent Users
- Flow: Run calculation, export results, record/share/gain insight from outcome; depends on desired user strategy.

UC5 - Attracting New Users to Moneytree Software

- Moneytree will use this new tool to attract new users and increase Moneytree's market share in the financial planning industry.
- Actors: Moneytree, Existing Moneytree Software and Calculation Engine, The Roth Optimization Tool
- Flow: Implement this new tool into existing software, attract new users, profit

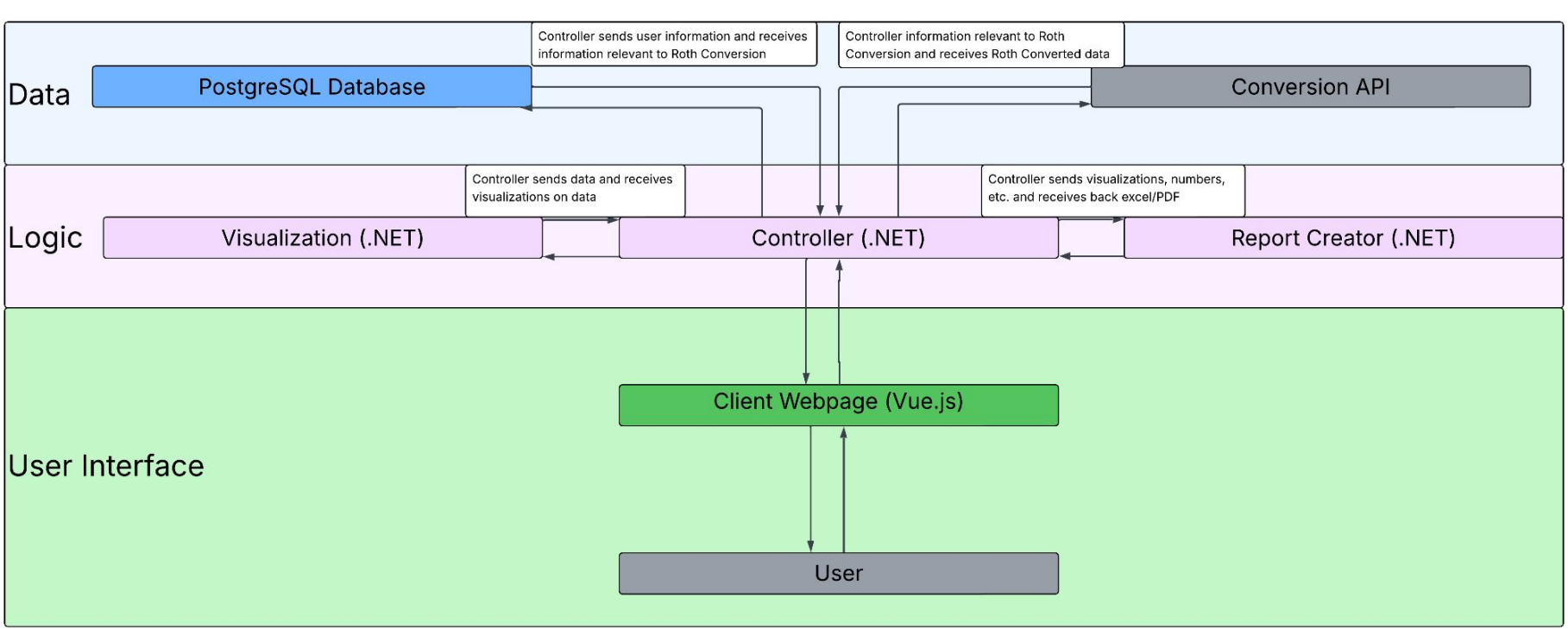
All Use Cases are here to satisfy BR1

Requirements

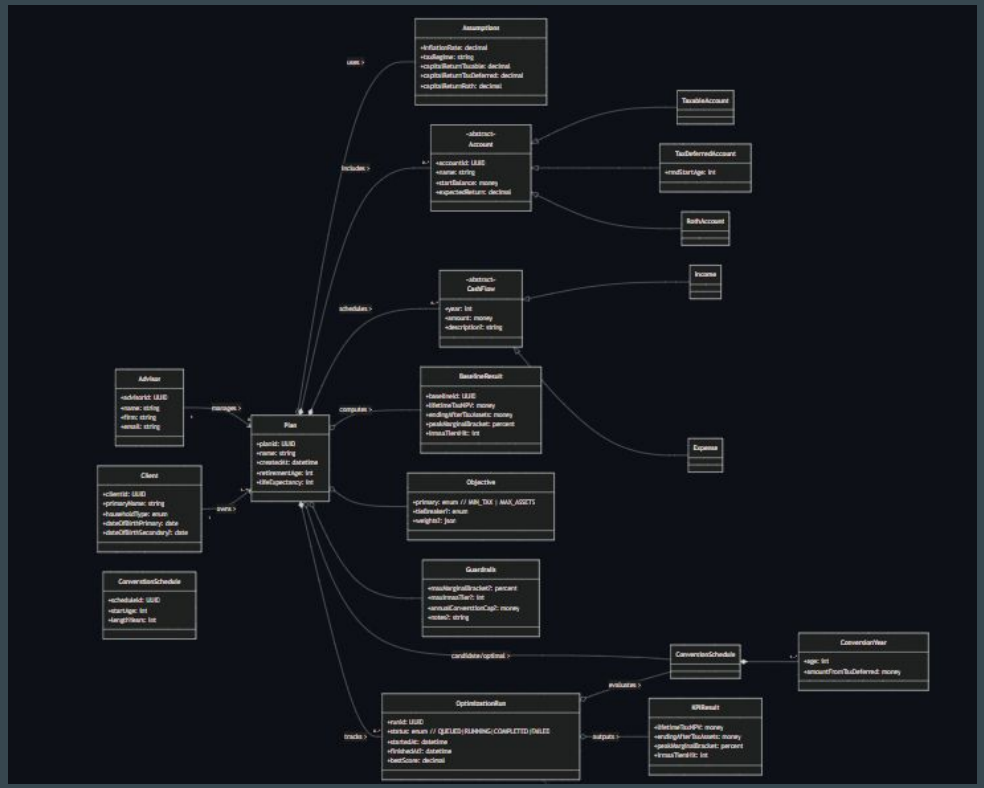
- Enter client financial parameters (age, income, expenses, etc.)
- Input current asset balances
- Input expected asset performance
- Run baseline “as-is” tax calculation
- Display baseline tax results
- Define Roth conversion objectives
- Enter start age & conversion period
- Store Roth conversion parameters
- Run multiple Roth conversion scenarios
- Determine optimal conversion strategy
- Compare optimal vs alternative strategies
- Generate Roth conversion reports
- Export results (PDF, CSV)

- Fast performance – results within 10 seconds
- Encrypt data in transit and at rest
- Role-based access control for security
- Clear, user-friendly interface with validation
- Tooltips/help for new users
- 99.5% uptime during business hours
- Auto-save progress every 2 minutes
- Browser compatibility (Chrome, Firefox, Edge)
- Limited mobile support (report viewing)
- Modular architecture for enhancements
- Automated tests (80% coverage)

Architecture



Domain Model



- Advisor - Professional user (financial planner) operating RothScope; used for access control and attribution.
- Client - The household being planned for; demographics drive retirement and life expectancy modeling.
- Plan - Scenario container linking assumptions, accounts, cash flows, objectives/guardrails, and results.
- Assumptions - Economic/tax parameters (inflation, returns per account type, tax regime) independent of decisions.
- Account / TaxableAccount / TaxDeferredAccount / RothAccount - Financial buckets with different tax behaviors (RMDs for tax-deferred; tax-free growth in Roth).
- CashFlow / Income / Expense - Time-indexed inflows/outflows shaping taxable income and feasibility.
- BaselineResult - KPIs for the "as-is" plan (no conversions) used as comparison.
- Objective - Optimization goal (minimize taxes or maximize ending overall assets).
- Guardrails - Advisors constraints (cap bracket, annual conversion cap).
- ConversionSchedule / ConversionYear - Year-by-year Roth conversion plan (when/how much).
- OptimizationRun - One optimization execution tracking status, best score, and outputs.
- KPIResult - Metrics returned by the engine for a schedule (lifetime taxes NPV, ending assets, peak bracket).
- MoneytreeEngine - External calculator evaluating a plan + schedule.

Tech Stack

All requirements given by client

Frontend

- *Vue.js

Backend

- *.NET

Database

- *PostgreSQL

Prototype

First Iteration Features

Functional Requirements

- Enter basic client financial parameters (age, life expectancy, income, expenses)
- Enter current asset balances (qualified and non-qualified)
- Enter expected performance rates on assets
- Perform a baseline “as-is” tax calculation
- Display baseline tax results in a clear format

Non-functional Requirements

- Encrypt sensitive financial data (in transit and at rest)
- Provide a clear, user-friendly interface with input validation

Justification

- Enables users to enter financial data
- Runs a baseline calculation
- Displays meaningful, secure results
- Establishes foundation for future iterations

Client Feedback

What they said:

- Everything looks good for the most part, just a few things may change as the project moves forward; need to remain flexible
- Minor nitpicks involving details
- They will review everything again and come back with more structured feedback if necessary

What we changed (thus far):

- A few minor details
- That’s it :)


ROTH
IRA
AND I ONLY HAD TO PAY TAX ON THE SEED