GridAI - Frontend

Faculty Advisor: Dr. Gelli

Team sddec25-17:

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Ethan Messmer (SE), Tristan Nono (SE), Evan Sivets (CprE)

What is GridAI?

Energy management system designed to help users make informed decisions with their energy

Our users:

- Homeowners
- Developers
- Energy Management Businesses
  - ISOs/DSOs/DERAs
- Utility Companies
- Students/Researchers

The backend has been in development for multiple years and many senior design projects

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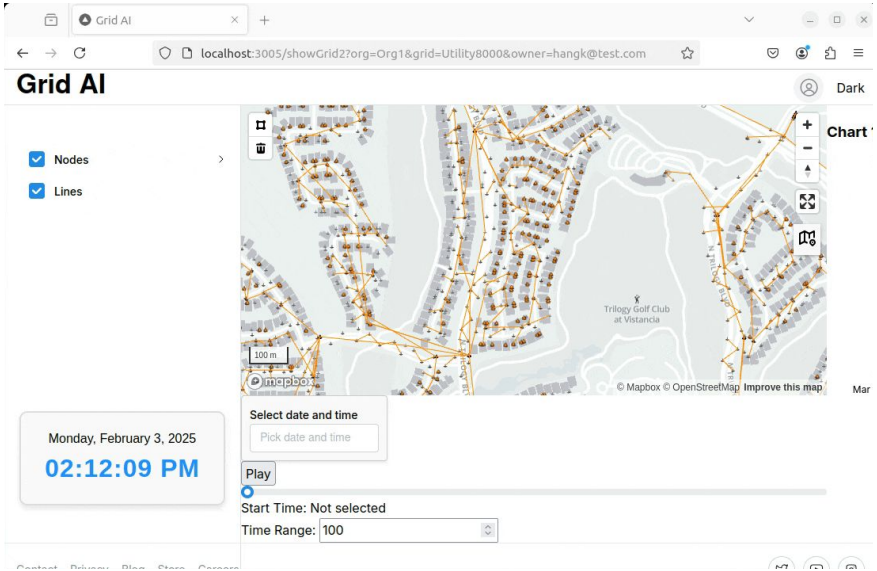
Project Overview

Dr Gelli - Faculty Advisor, Research Professor

Our role:

- Data retrieval from existing backend APIs
- Updating frontend:
  - Better responsiveness for all users
  - Improve data insights
  - Update features
  - Transition component library from MantineUI to ShadCN (maintainability)



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Tech Stack & Components

Frontend:

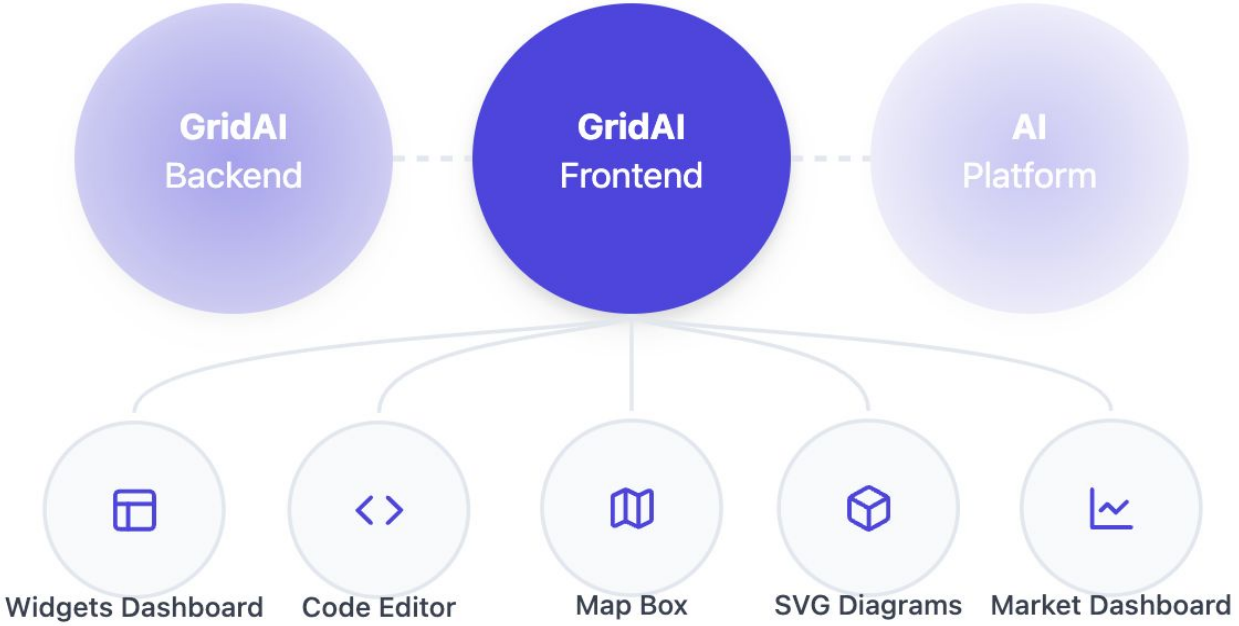
- Next.js
- Tailwind CSS
- TypeScript

Backend:

- Node.js
- Express.js

Database:

- Firebase
- Neo4j
- Apache Kafka



Tristan & Ponciano	Yusef	Nick	Evan	Ethan

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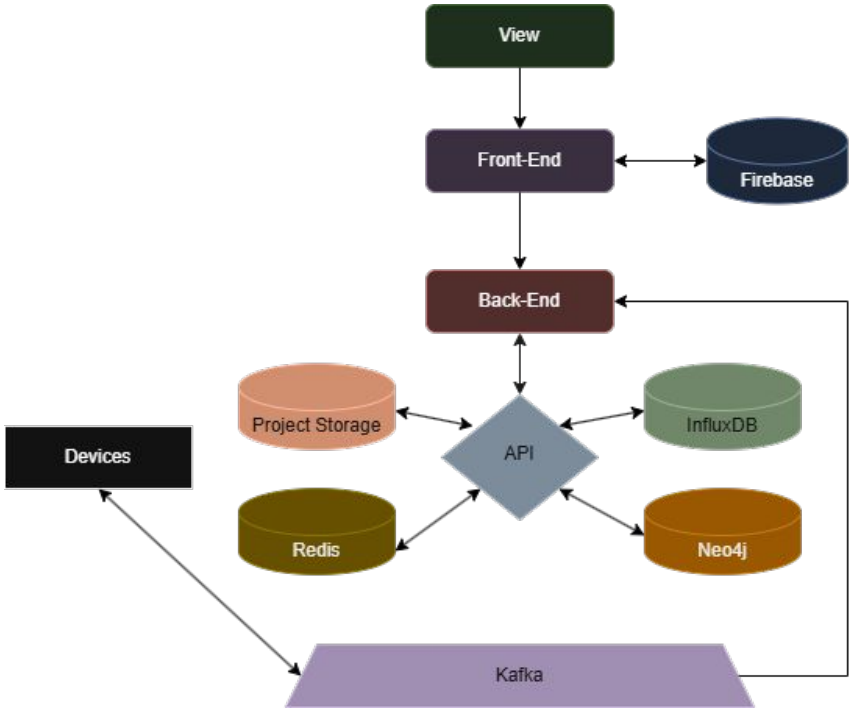
High-Level Design



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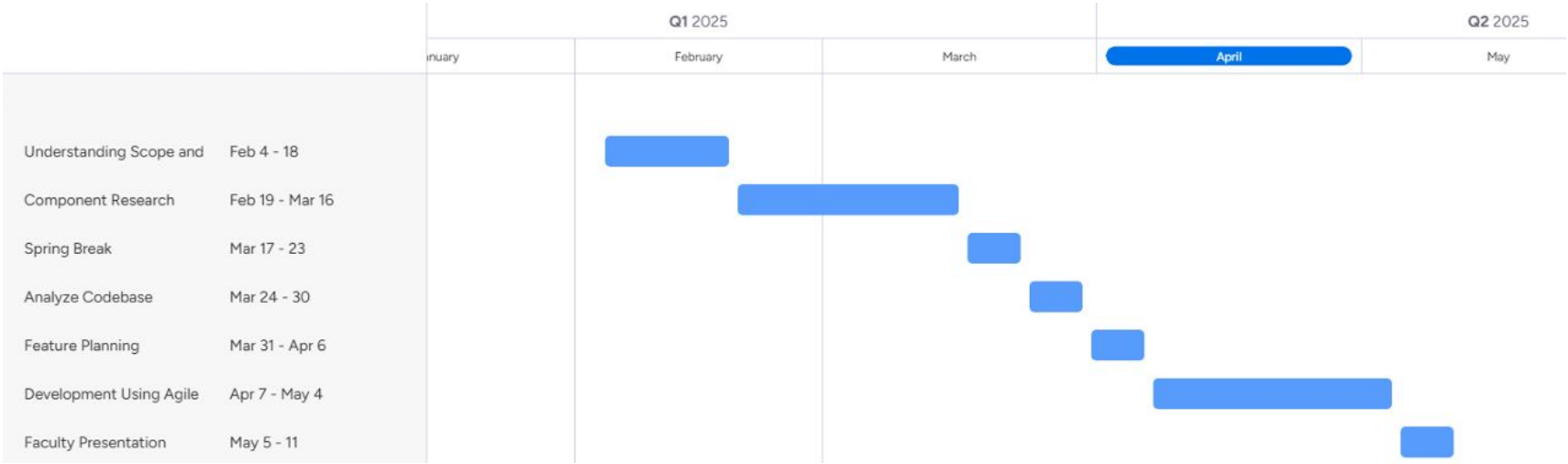
Our Schedule (Gantt Chart)



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Ethics

Aspects that must happen

- Uptime must be high
- Data must be accurate
- Security
- Accessibility

Accessibility

Our application intends to suitable for 3 main user groups:

- Residential users
- Educational users
- Commercial and industrial users

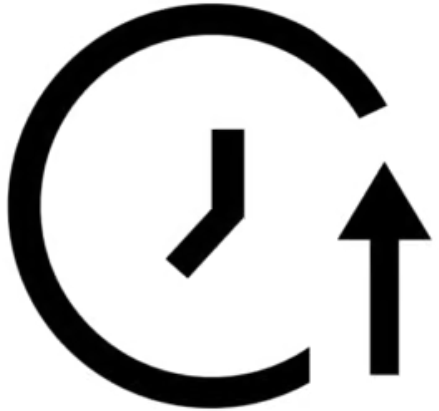
To ensure this we need:

- Cognitive accessibility - clear UI, tooltips, simple modes
- Visual accessibility - color contrast checks, screen reader support
- Device accessibility - responsive across device sizes and platforms

Uptime

GridAI's reliability must be critical during its use for the following reasons:

1. Real-time misinformation
    - Downtime = stale data
2. Financial impact
    - Outages distort market bids
3. Equity of access
    - Would hurt small DERAs more than anyone else



Data Accuracy

High data accuracy is essential because:

1. Prevents market manipulation
    - False prices hurt fairness
2. Can prevent Grid instability
    - Errors cause outages
3. Transparency and accountability
    - Higher credibility

Security

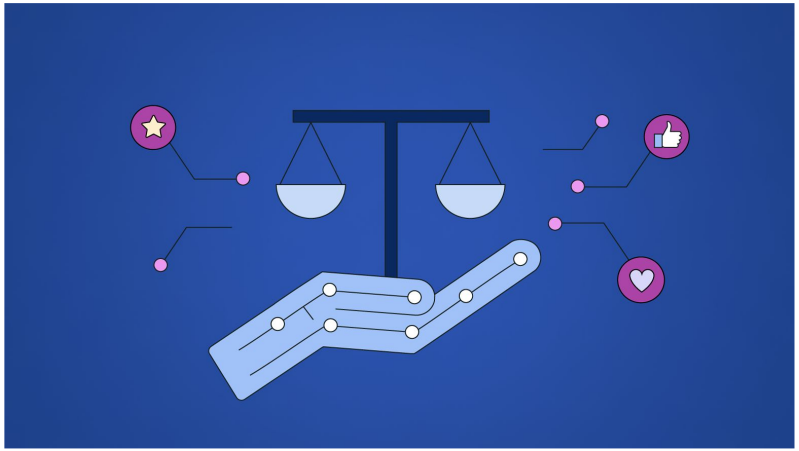
GridAI must be secure because our users need:

1. Secure logins
    - Avoid accounts from being breached
2. Data protection
    - Prevent wrong data from being shown to unauthorized groups
    - Keeping data safe via Firebase authentication
    - Have robust testing to ensure data integrity

Ethicality of Artificial Intelligence

Ethical use of A.I. in GridAI is important because:

1. It must be fair to all users
2. It must be accountable
    - Responsible A.I. usage
3. Transparency between users and A.I.
4. Protection from sensitive information



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Questions?

Thank you!

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Widgets Component

- Interactive UI component that displays real-time data
- Allows to represent grid data dynamically according to the user
- User friendly, customizable per user's needs

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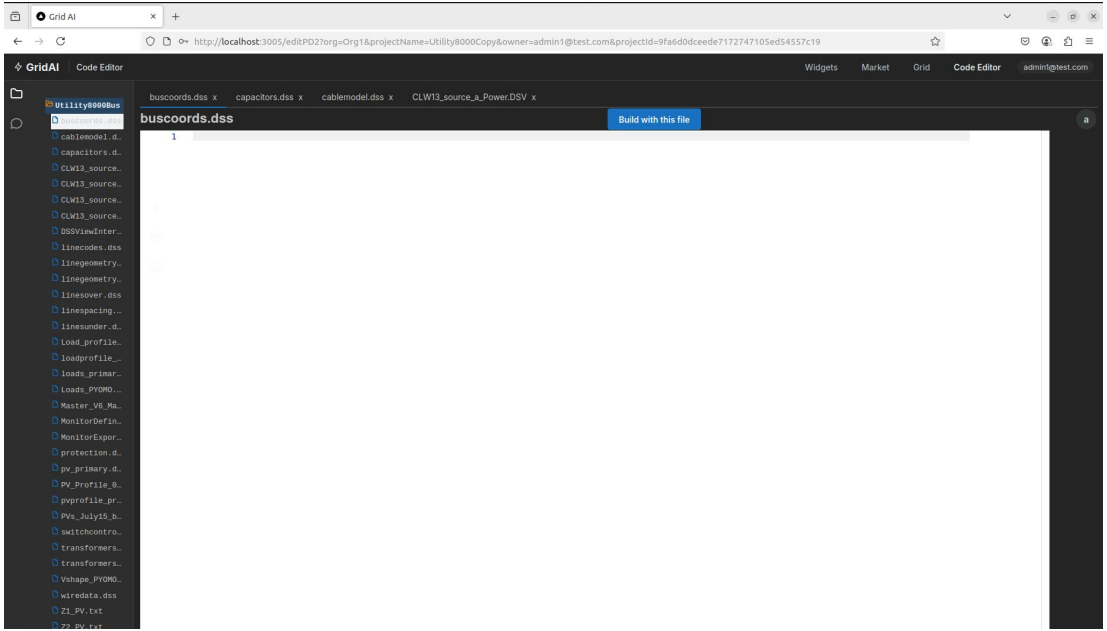
Live Code Editor Component

- Real-time collaborative editing
- Built with Monaco Editor for rich features
- Includes file navigation, comments, and chat
- Syncs file changes using websockets



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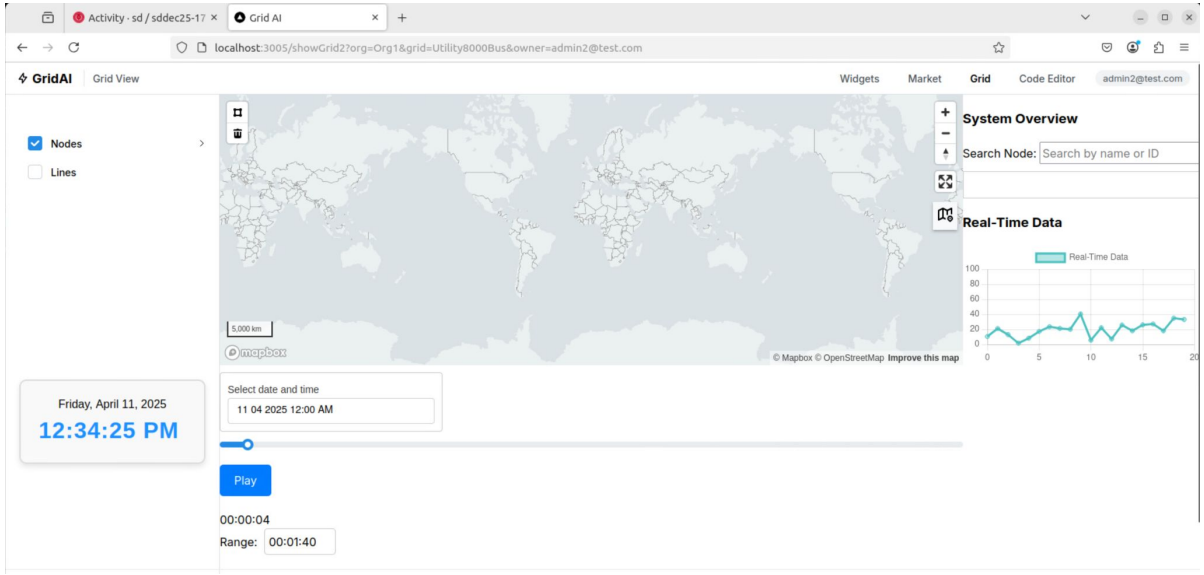
Map Box Component

"Map Box" visualization of energy usage data:

- per node
- per highlighted, connected cluster of user's nodes
- Real-time & historical
- Dexie.js/Web Workers
- React Map GL (map)
- Deck.GL (nodes)

Custom node icons:

- EV Chargers
- Solar Panels
- Substations
- Transformers



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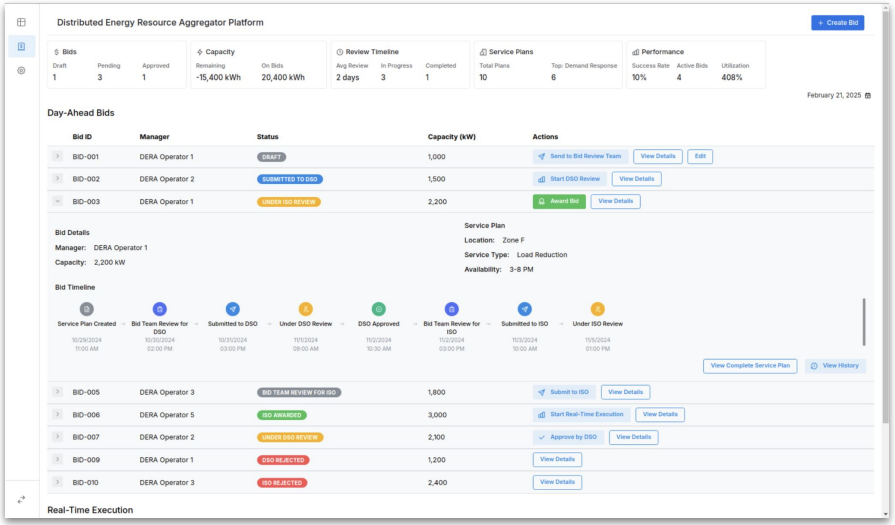
Market Dashboard Component

- Shows market data for pricing and grid management
- Changes based off of user type (DSO, ISO, DERA) to suit their needs
- Users can submit, review, counteroffer, accept and decline bids/proposals
- Provides both and historical data tracking for users



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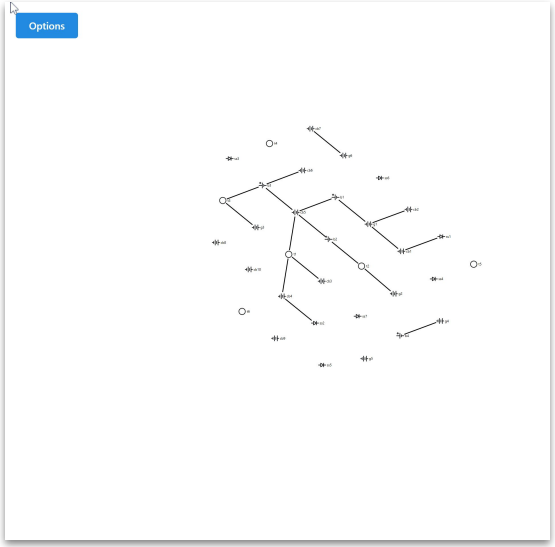
Single Line Diagram Component

- Reflects Real-Time connections and faults
- Only the qualified should be making diagrams
- Provide up to date clear information



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