Pixel Coliseum

The purpose is to design and develop a web-based 2D co-operative survival arena game that demonstrates real-time multiplayer networking, intelligent AI behavior, persistent player progression, and stat tracking through a modern web tech stack.

Goals

- Create a browser-playable 2D game using TypeScript (Phaser 3), Node.js (Colyseus), and PostgreSQL
- Implement co-op multiplayer where players team up to survive increasingly difficult waves of AI-controlled enemies
- Integrate AI systems that manage enemy perception, decision-making, and adaptive difficulty
- Add power-ups, weapon pickups, for strategic and interesting gameplay
- Implement stat tracking stored in a PostgreSQL database for long-term progression.
- Deliver a polished, secure, and scalable gameplay experience showcasing full-stack software engineering, networking, and AI concepts

Team Members

- Cameron Estridge - Senior CS student (estridcc@mail.uc.edu)
  * This is a solo project

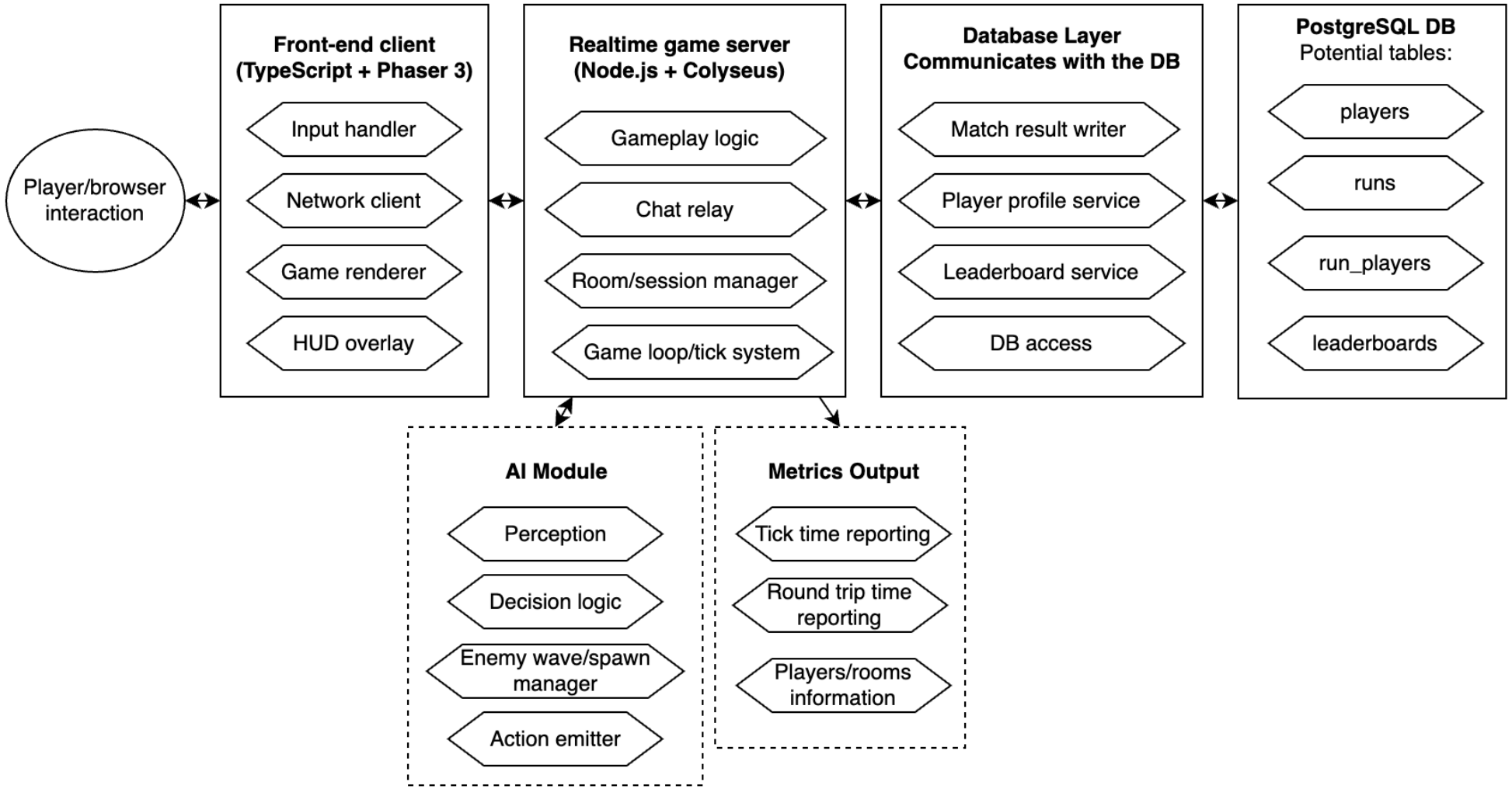
Project Advisor

- Mark Reiss - Senior SWE @ Marathon (mark.a.reiss@gmail.com)

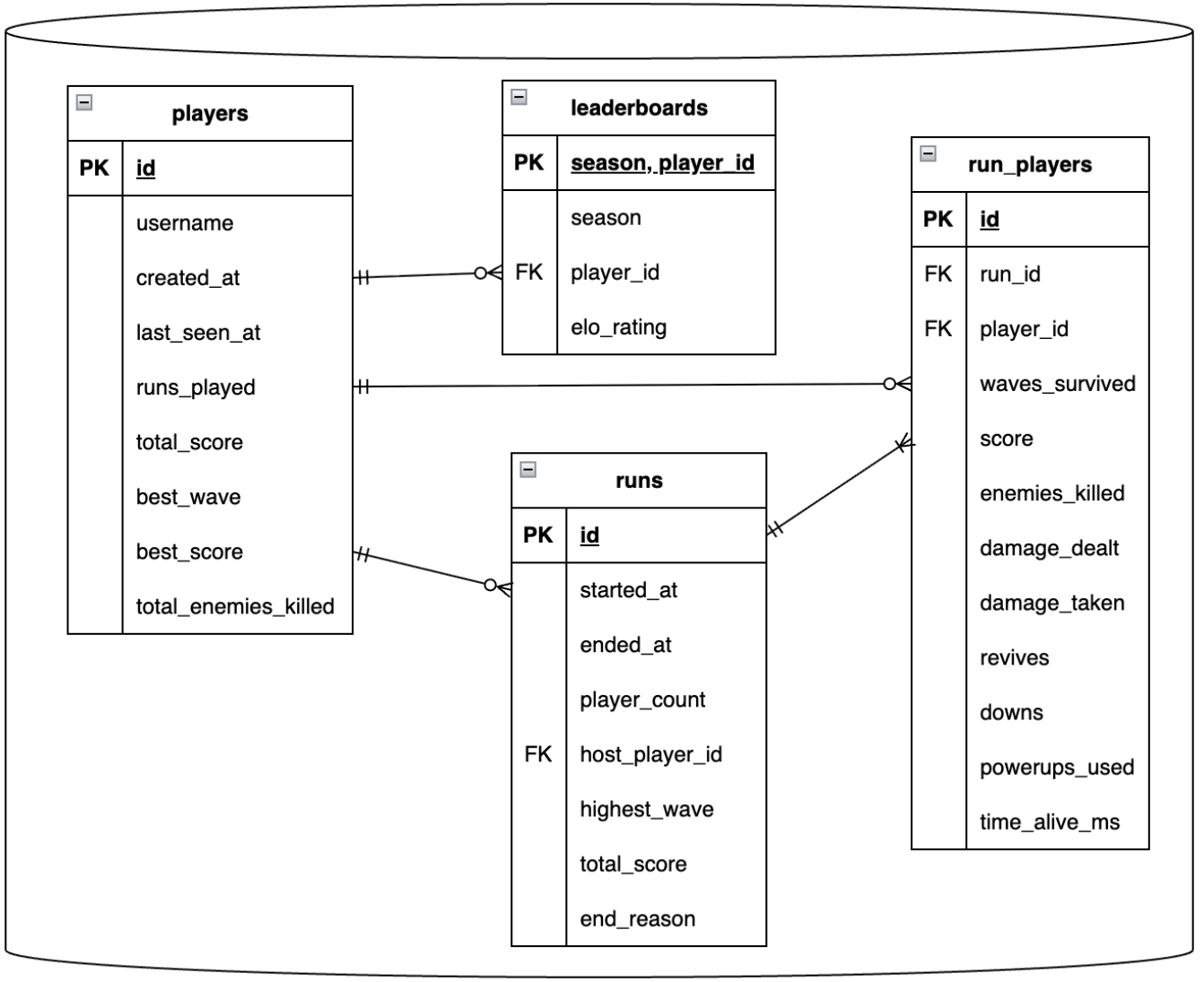
Project Abstract

Pixel Coliseum is a web-based 2D cooperative survival game where players battle waves of AI-controlled enemies in a fast-paced arena environment. Developed using Phaser 3, TypeScript, Node.js, Colyseus, and PostgreSQL, the project demonstrates real-time multiplayer networking, artificial intelligence, and database integration within a browser-accessible platform. Players can team up online, collect power-ups and various weapons, and compete for high survival scores across multiple rounds. The system tracks player performance, stores persistent statistics, and includes in-game chat functionality. The project highlights full-stack development, networking, and AI design while emphasizing scalability, interactivity, and engaging gameplay through modern web technologies.

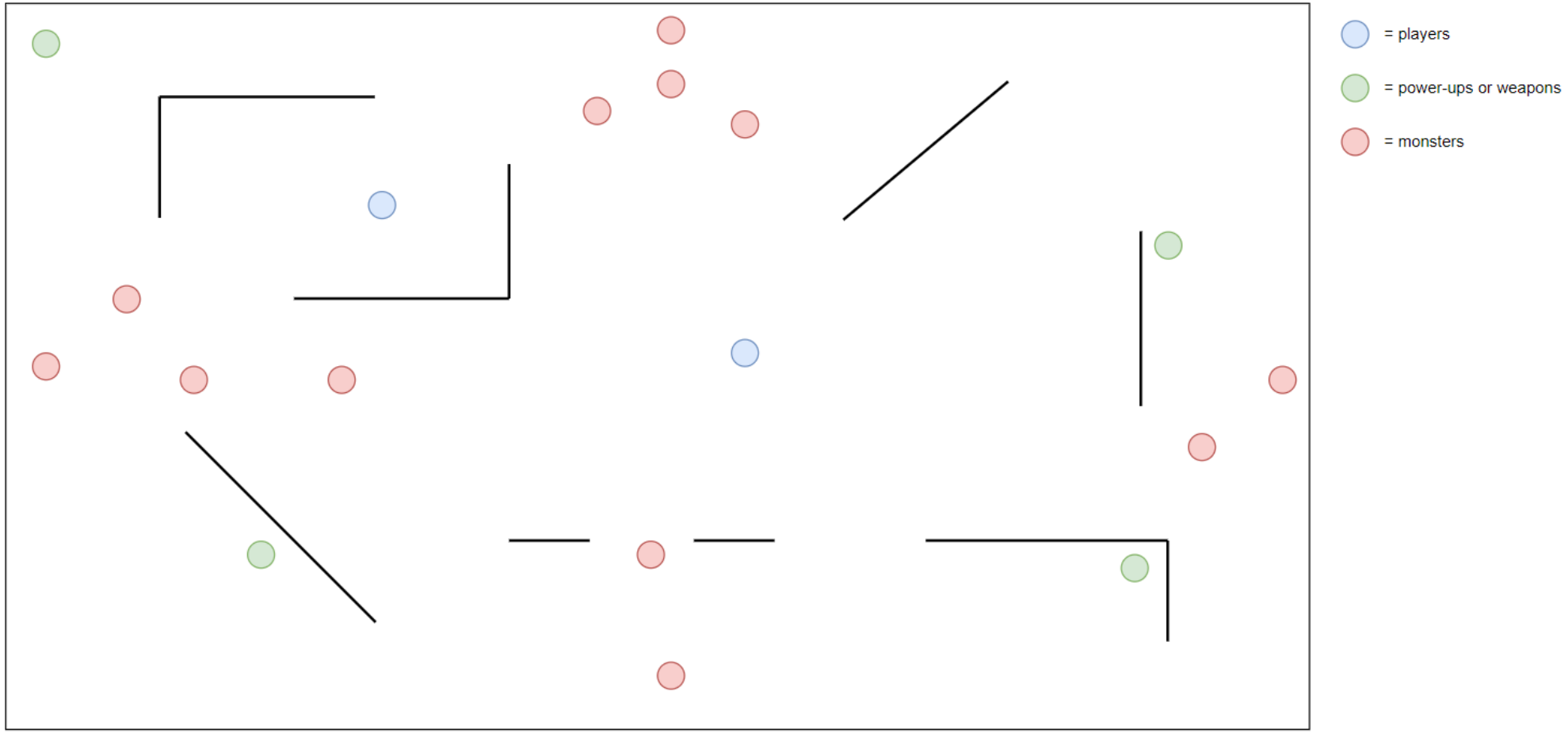
Design Diagram



Database Schema



Game Design



Game Design

- Infinite number of rounds
  - Goal is to survive as many rounds as possible
- Number of enemies begins at 4 for round 1, then increases by 2 each round
- Maximum number of enemies will be 30 at round 13
- Enemies will still increase in difficulty (faster, stronger, etc.)
- 3 weapon types: sword, bow, staff
- Power-up types: maximum health, speed, and damage increases
- Power-ups spawn randomly at dedicated locations on the map

User Stories

- As a player, I want to join an online match so that I can team up with other players in real time
- As a player, I want to fight against intelligent AI enemies so that the game is more challenging
- As a player, I want to pick up different weapons and power-ups in the arena so that I can gain a strategic advantage and vary my fighting strategy
- As a player, I want to view my stats and rankings so that I can track my progress and compare my performance with others
- As a player, I want to chat with my opponent during a match so that I can communicate or socialize while playing

Major Project Constraints

- **Economic:** Must rely entirely on open-source tools and self-hosted testing due to no external budget
- **Professional:** Requires polished, maintainable design suitable for public presentation
- **Ethical:** Avoids collecting personal data and ensures respectful, non-offensive content
- **Security:** Multiplayer networking must prevent cheating and protect player data

Project Progress

- Repository initialized and organized on GitHub
- README.md and project documentation completed
- Design diagrams (D0-D2) finalized
- Initial TypeScript frontend and Node.js backend structure created
- Local PostgreSQL database configured and accessible
- Development environment builds successfully

Expected Accomplishments for End of Term

- Find and select free sprite art, or create my own
- Implement a basic “Hello World” Phaser scene and run it successfully through Vite dev server
- Initialize a minimal Colyseus server that starts and responds to basic client connections
- Finalize the database schema for player statistics and match history.
- Finalize the design of game rules and mechanics

Expected demo at expo

- Two laptops will connect to the same online Pixel Coliseum server over a local or hosted network
- Players will enter the same arena and fight off waves of AI-controlled monsters cooperatively until they lose
- Real-time multiplayer synchronization, showing smooth movement and shared game state
- Players can collect various power-ups and weapons to use strategically
- Players can track their scores and view their all-time statistics
- The game will also demonstrate the enemy AI system
- A small HUD will display health, score, and chat messages for both players
- The server’s performance metrics will be visible for debugging or demonstration purposes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