CSC 710 — Battleship Online Multiplayer

Technical Design Document

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Course: CSC 710

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1. Project Overview

1.1 Description

A real-time, browser-based multiplayer Battleship game where players can join a lobby, find opponents through matchmaking or custom tables, and play the classic 10×10 grid naval combat game. The application features user authentication, live lobby status, FIFO-based matchmaking, private table creation with join-request approval, in-lobby text chat, player profiles with win/loss statistics, and a responsive UI that works across desktop and mobile devices.

1.2 Core Features

Feature	Description	Priority
Landing Page	Engaging entry page with “Play Now” CTA	P0
Authentication	Email/password registration and login via Supabase Auth	P0
Lobby System	Real-time player counts (active, playing, waiting)	P0
Quick Match	FIFO-based matchmaking — join queue or get matched instantly	P0
Custom Tables	Create private table, receive/approve join requests	P0
Game Board	Classic 10×10 grid with ship placement and turn-based attacks	P0
Ship Placement	Drag-and-drop or click-to-place 5 ships with “Ready” confirmation	P0
Realtime Gameplay	WebSocket-powered instant move synchronization	P0
Lobby Chat	Text-based chat in the lobby	P1
Player Profiles	Win/loss record, match history	P1
Game End Screen	Score display with “Play Again” and “Return to Lobby” options	P0
Disconnect Handling	2-minute reconnect window	P1
Responsive Design	Desktop and mobile-friendly layout	P1

1.3 Classic Battleship Rules

- **Grid Size:** 10×10 (columns A–J, rows 1–10)
- **Ships:**

Ship	Size (cells)
Carrier	5
Battleship	4
Cruiser	3
Submarine	3
Destroyer	2

- Ships can be placed horizontally or vertically, but cannot overlap or go out of bounds.
- Players alternate turns, each selecting one cell on the opponent’s grid.

- Result is either **Hit** (cell contains a ship segment) or **Miss** (empty water).
- A ship is **Sunk** when all its cells are hit.
- The game ends when one player sinks all five of the opponent's ships.

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2. Tech Stack

2.1 Technology Choices

```
┌─────────────────────────────────────────────────────────────┐
│                         TECH STACK                          │
├──────────────┬──────────────────────────────────────────────┤
│ Frontend     │ React 18 + Vite + Tailwind CSS              │
│ Backend      │ Supabase (PostgreSQL + Realtime + Auth)      │
│ Hosting      │ GitHub Pages (static)                        │
│ CI/CD        │ GitHub Actions                               │
│ Language     │ TypeScript                                   │
│ State Mgmt   │ React Context + useReducer                   │
│ Routing      │ React Router v6                              │
│ Realtime     │ Supabase Realtime (WebSocket / Channels)     │
└──────────────┴──────────────────────────────────────────────┘
```

2.2 Key Dependencies

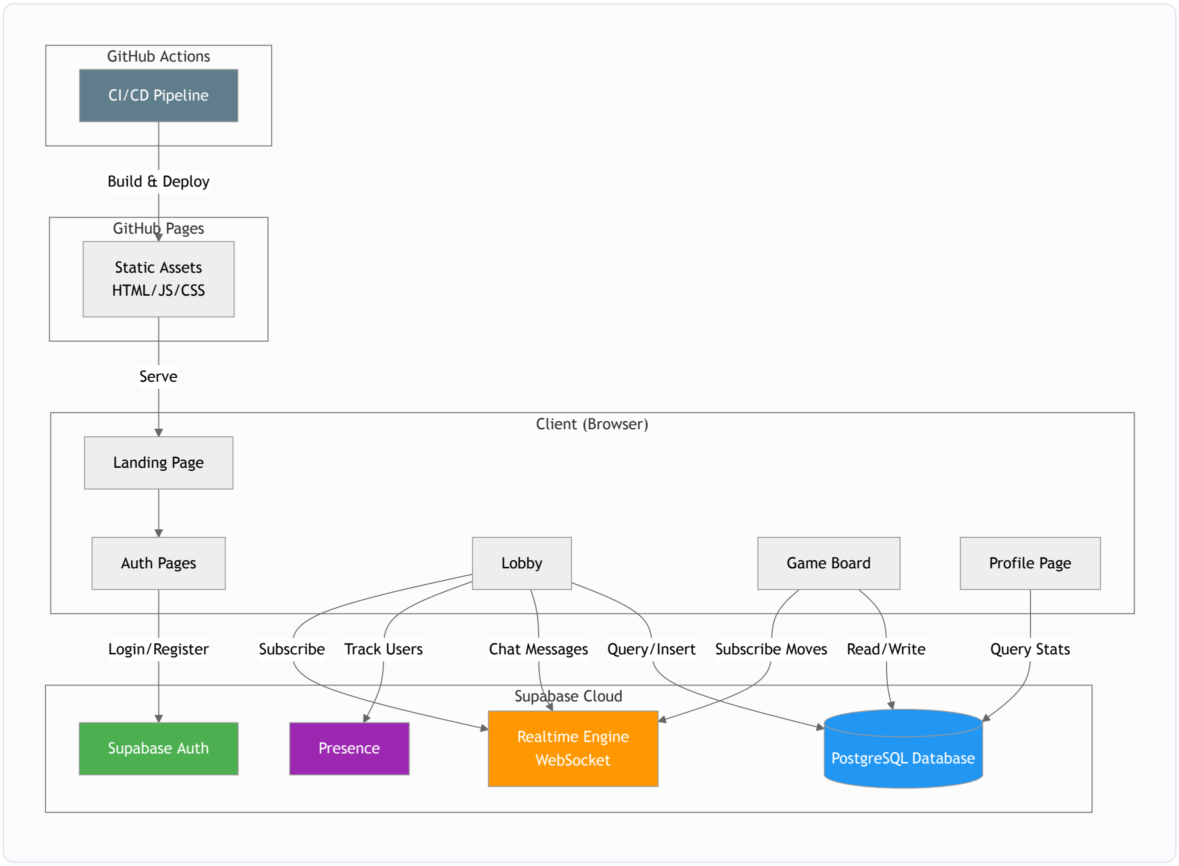
Package	Purpose	Version
`react`	UI framework	^18.x
`react-router-dom`	Client-side routing	^6.x
`@supabase/supabase-js`	Supabase client SDK	^2.x
`tailwindcss`	Utility-first CSS	^3.x
`vite`	Build tool & dev server	^5.x
`typescript`	Type safety	^5.x
`react-icons`	Icon library	^4.x
`react-hot-toast`	Toast notifications	^2.x
`framer-motion`	Animations (optional)	^10.x

2.3 Supabase Services Used

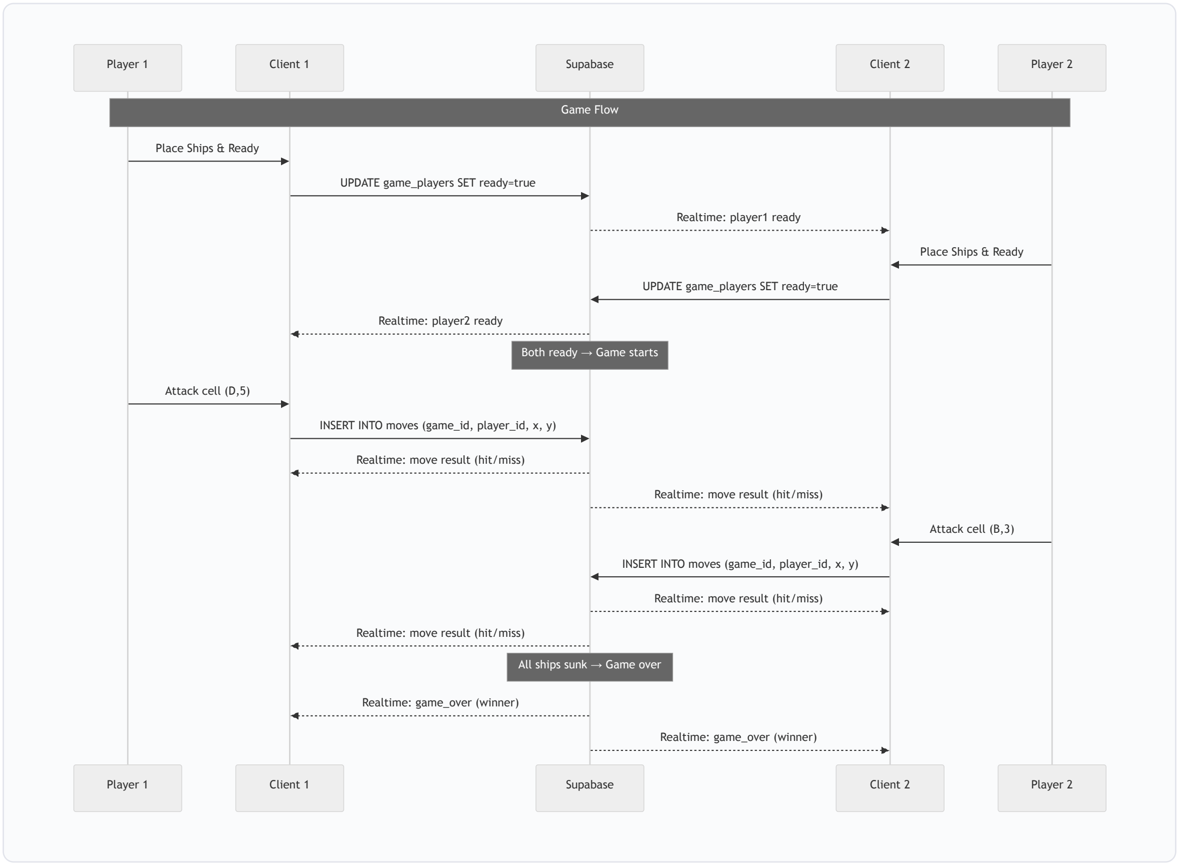
Service	Usage
Auth	Email/password registration and login
Database (PostgreSQL)	All persistent data: users, games, moves, tables, chat
Realtime	Live game moves, lobby updates, presence tracking, chat
Presence	Track online users in lobby

3. System Architecture

3.1 High-Level Architecture



3.2 Data Flow Architecture


Player 1
Client 1
Supabase
Client 2
Player 2
Game Flow
Place Ships & Ready
UPDATE game_players SET ready=true
Realtime: player1 ready
Place Ships & Ready
UPDATE game_players SET ready=true
Realtime: player2 ready
Both ready → Game starts
Attack cell (D,5)
INSERT INTO moves (game_id, player_id, x, y)
Realtime: move result (hit/miss)
Realtime: move result (hit/miss)
Attack cell (B,3)
INSERT INTO moves (game_id, player_id, x, y)
Realtime: move result (hit/miss)
Realtime: move result (hit/miss)
All ships sunk → Game over
Realtime: game_over (winner)
Realtime: game_over (winner)

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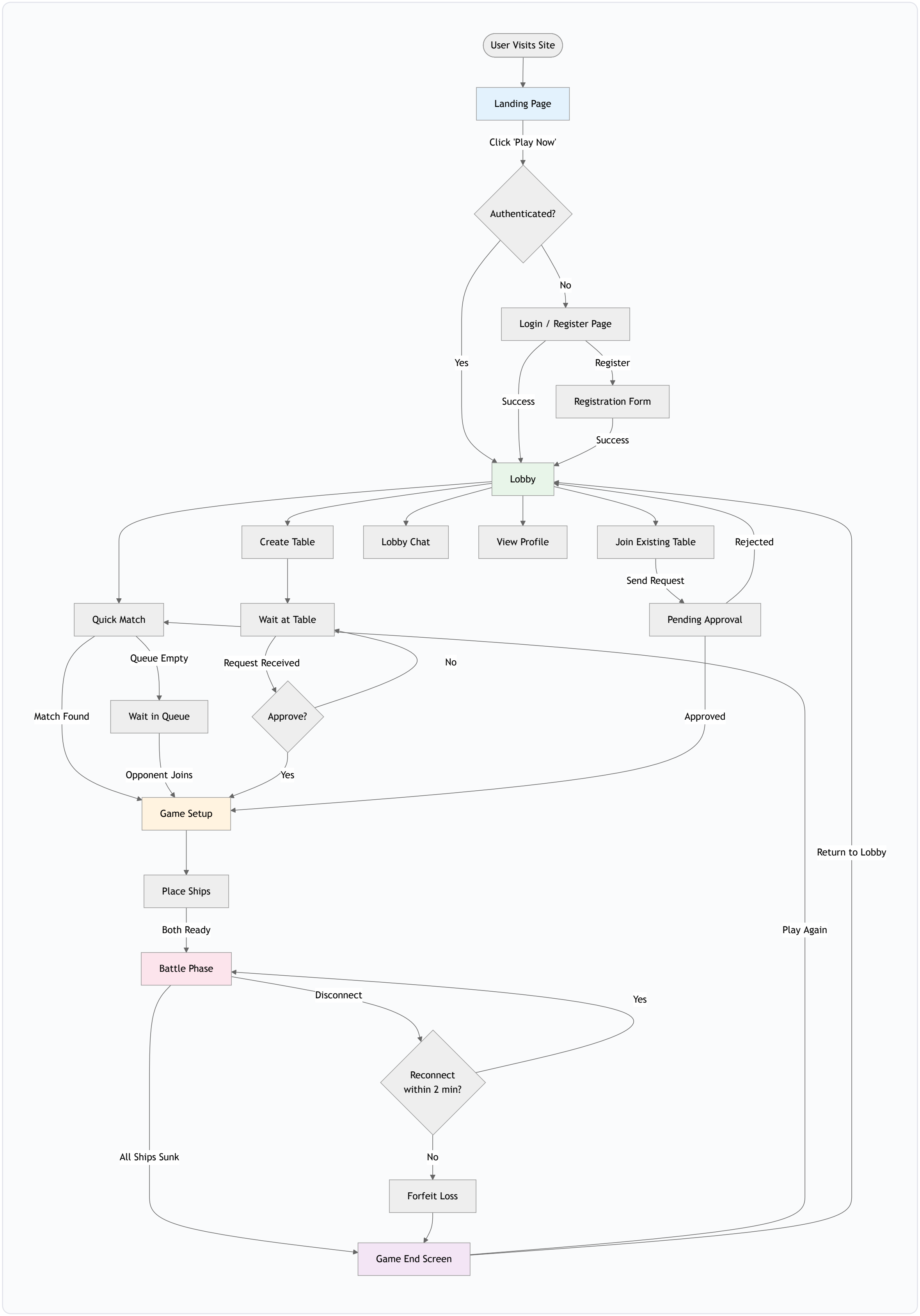
4. Application Flow

4.1 Complete User Journey


User Visits Site
Landing Page
Click 'Play Now'
Authenticated?
No
Yes
Login / Register Page
Register
Success
Registration Form
Success
Lobby
Create Table
Lobby Chat
View Profile
Join Existing Table
Rejected
Send Request
Quick Match
Wait at Table
Pending Approval
Queue Empty
Request Received
No
Match Found
Wait in Queue
Approve?
Approved
Opponent Joins
Yes
Game Setup
Return to Lobby
Place Ships
Both Ready
Play Again
Battle Phase
Disconnect
Yes
Reconnect within 2 min?
All Ships Sunk
No
Forfeit Loss
Game End Screen

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5. Page & Screen Specifications

5.1 Landing Page

Route: `/`

Element	Description
Hero Section	Full-viewport background with naval/ocean theme
Title	"Battleship Online" — large, animated text
Tagline	"Sink your enemies. Dominate the seas."
CTA Button	"Play Now" — prominent, animated, navigates to `/lobby` (triggers auth check)
Features Section	3 cards: Real-time Multiplayer, Global Leaderboard, Mobile Friendly
Footer	Team credits, CSC 710, GitHub link

Design Notes: - Dark navy blue background with subtle wave animation (CSS/SVG) - "Play Now" button should pulse or glow to draw attention - Minimal content — the goal is to funnel users to the lobby quickly

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5.2 Authentication Pages

Routes: `/login`, `/register`

Login Form Fields: | Field | Type | Validation | |——-|——|————| | Email | email | Required, valid email format | | Password | password | Required, min 6 characters |

Registration Form Fields: | Field | Type | Validation | |——-|——|————| | Display Name | text | Required, 3–20 chars, unique | | Email | email | Required, valid email, unique | | Password | password | Required, min 6 chars | | Confirm Password | password | Must match password |

Behavior: - On successful login/register → redirect to `/lobby` - Show inline validation errors - "Already have an account?" / "Don't have an account?" toggle links

-

5.3 Lobby

Route: `/lobby`
Auth Required: Yes (redirect to `/login` if not authenticated)

Layout Structure

```
┌─────────────────────────────────────────────────────────┐
│  HEADER: Logo | Welcome, {username} | Profile | Logout  │
├───────────────────────┬─────────────────────────────────┤
│                       │                                 │
│   LOBBY STATS         │    TABLE LIST                   │
│   ┌───────────────┐   │   ┌──────────────────────────┐  │
│   │ 🟢 Online: 24 │   │   │ Table #1 - UserA (waiting)│ │
│   │ 🎮 Playing: 8 │   │   │ [Request to Join]        │  │
│   │ ⏳ Waiting: 4 │   │   ├──────────────────────────┤  │
│   └───────────────┘   │   │ Table #2 - UserB (waiting)│ │
│                       │   │ [Request to Join]        │  │
│   ┌───────────────┐   │   └──────────────────────────┘  │
│   │  QUICK MATCH  │   │                                 │
│   │  [▶ Play Now] │   │                                 │
│   └───────────────┘   │                                 │
│                       │                                 │
│   ┌───────────────┐   │                                 │
│   │ CREATE TABLE  │   │                                 │
│   │ [+ New Table] │   │                                 │
│   └───────────────┘   │                                 │
│                       │                                 │
├───────────────────────┴─────────────────────────────────┤
│  CHAT BOX                                               │
│  ┌───────────────────────────────────────────────────┐  │
│  │ UserA: gg last game                               │  │
│  │ UserB: anyone want to play?                       │  │
│  │ You: let's go!                                    │  │
│  ├───────────────────────────────────────────────────┤  │
│  │ [Type a message...                    ] [Send]    │  │
│  └───────────────────────────────────────────────────┘  │
└─────────────────────────────────────────────────────────┘
```

Lobby Stats (Real-time via Supabase Presence)

Stat	Source	Update Frequency
Online Players	Presence channel subscription count	Real-time
Currently Playing	Count of games with status `in_progress`	Real-time
Waiting for Match	Count of players in matchmaking queue + open tables	Real-time

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5.4 Game Screen

Route: `/game/:gameId`

Phase 1: Ship Placement

```
┌──────────────────────────────────────────────────────┐
│  HEADER: Game #1234 | vs. Opponent | Phase: Setup    │
├──────────────────────────────┬───────────────────────┤
│                              │                       │
│    YOUR BOARD (10×10)        │   SHIP INVENTORY      │
│                              │                       │
│   A B C D E F G H I J       │   □ Carrier (5)       │
│ 1 . . . . . . . . . .       │   □ Battleship (4)    │
│ 2 . . . . . . . . . .       │   □ Cruiser (3)       │
│ 3 . . . . . . . . . .       │   □ Submarine (3)     │
│ 4 . . . . . . . . . .       │   □ Destroyer (2)     │
│ 5 . . . . . . . . . .       │                       │
│ 6 . . . . . . . . . .       │   [Rotate Ship]       │
│ 7 . . . . . . . . . .       │   [Random Place]      │
│ 8 . . . . . . . . . .       │   [Clear Board]       │
│ 9 . . . . . . . . . .       │                       │
│10 . . . . . . . . . .       │   [✓ I'm Ready]       │
│                              │                       │
├──────────────────────────────┴───────────────────────┤
│  Status: Waiting for opponent to place ships...      │
└──────────────────────────────────────────────────────┘
```

Phase 2: Battle

```
┌───────────────────────────────────────────────────────────┐
│  HEADER: Game #1234 | vs. Opponent | Turn: YOUR TURN      │
├────────────────────────────┬──────────────────────────────┤
│                            │                              │
│   OPPONENT'S BOARD         │      YOUR BOARD              │
│   (attack here)            │      (your ships)            │
│                            │                              │
│   A B C D E F G H I J     │    A B C D E F G H I J      │
│ 1 . . . 💥 . . . . . .    │  1 . . 🚢🚢🚢🚢🚢 . . .    │
│ 2 . . . . . . . . . .     │  2 . . . . . . . . . .      │
│ 3 . 🌊 . . . . . . . .    │  3 . . . . 💥 . . . . .    │
│ 4 . . . . . . . . . .     │  4 . . . . 🚢 . . . . .     │
│ 5 . . . . . . . . . .     │  5 . . . . 🚢 . . . . .     │
│ 6 . . . . . . . . . .     │  6 . . . . 🚢 . . . . .     │
│ 7 . . . . . . . . . .     │  7 . . . . . . . . . .      │
│ 8 . . . . . . . . . .     │  8 🚢🚢 . . . . . . . .     │
│ 9 . . . . . . . . . .     │  9 . . . . . . . . . .      │
│10 . . . . . . . . . .     │ 10 . . . 🚢🚢🚢 . . . .    │
│                            │                              │
├────────────────────────────┴──────────────────────────────┤
│  SHIP STATUS: Carrier ✓ | Battleship ✓ | Cruiser ✓ |     │
│              Submarine ✓ | Destroyer 💀 (SUNK)           │
└───────────────────────────────────────────────────────────┘
```

Cell States:

Symbol	Meaning	Color
`.`	Unknown / Empty	Light blue
🚢	Your ship (own board only)	Dark gray
💥	Hit	Red
🌊	Miss	White/Light
💀	Sunk ship segment	Dark red

5.5 Game End Screen

Route: `/game/:gameId` (overlay or state change)

```
┌──────────────────────────────────────────┐
│                                          │
│         🏆 VICTORY! 🏆                   │
│     (or ❌ DEFEAT ❌)                    │
│                                          │
│     You sunk all enemy ships in          │
│           32 moves!                      │
│                                          │
│     ┌──────────────────────────┐         │
│     │ Your Hits:    14         │         │
│     │ Your Misses:  18         │         │
│     │ Accuracy:     43.8%      │         │
│     │ Ships Lost:   3/5        │         │
│     └──────────────────────────┘         │
│                                          │
│     [🔄 Play Again]  [🏠 Lobby]         │
│                                          │
└──────────────────────────────────────────┘
```

5.6 Profile Page

Route: `/profile` or `/profile/:userId`

Section	Data
Display Name	Editable (own profile)
Email	Read-only
Member Since	Registration date
Total Games	Count of completed games
Wins / Losses	Win count, loss count
Win Rate	Percentage
Match History	Last 20 games: opponent, result, date, move count

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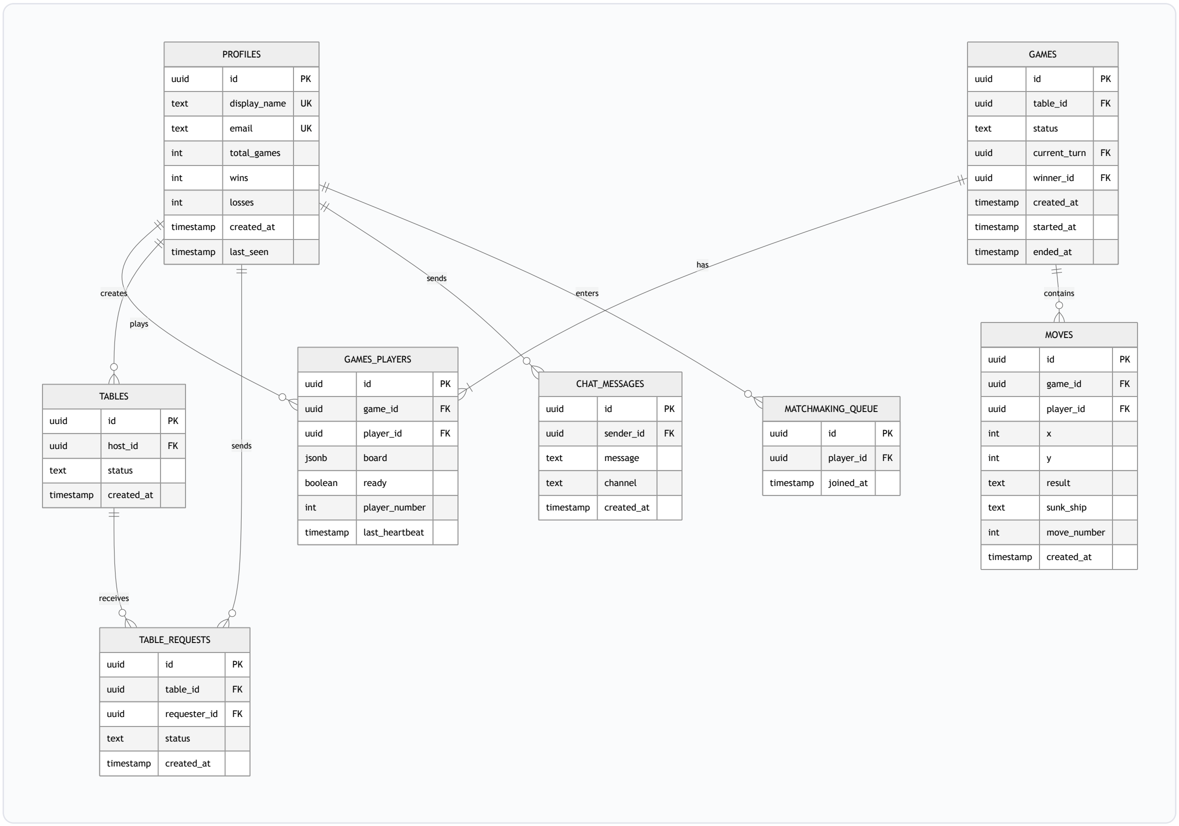
6. Database Schema

6.1 Entity Relationship Diagram



PROFILES		
uuid	id	PK
text	display_name	UK
text	email	UK
int	total_games	
int	wins	
int	losses	
timestamp	created_at	
timestamp	last_seen	

GAMES		
uuid	id	PK
uuid	table_id	FK
text	status	
uuid	current_turn	FK
uuid	winner_id	FK
timestamp	created_at	
timestamp	started_at	
timestamp	ended_at	

TABLES		
uuid	id	PK
uuid	host_id	FK
text	status	
timestamp	created_at	

GAMES_PLAYERS		
uuid	id	PK
uuid	game_id	FK
uuid	player_id	FK
jsonb	board	
boolean	ready	
int	player_number	
timestamp	last_heartbeat	

CHAT_MESSAGES		
uuid	id	PK
uuid	sender_id	FK
text	message	
text	channel	
timestamp	created_at	

MATCHMAKING_QUEUE		
uuid	id	PK
uuid	player_id	FK
timestamp	joined_at	

MOVES		
uuid	id	PK
uuid	game_id	FK
uuid	player_id	FK
int	x	
int	y	
text	result	
text	sunk_ship	
int	move_number	
timestamp	created_at	

TABLE_REQUESTS		
uuid	id	PK
uuid	table_id	FK
uuid	requester_id	FK
text	status	
timestamp	created_at	

6.2 Table Definitions

`profiles`

Extends Supabase Auth `auth.users`. Created automatically on registration via database trigger.

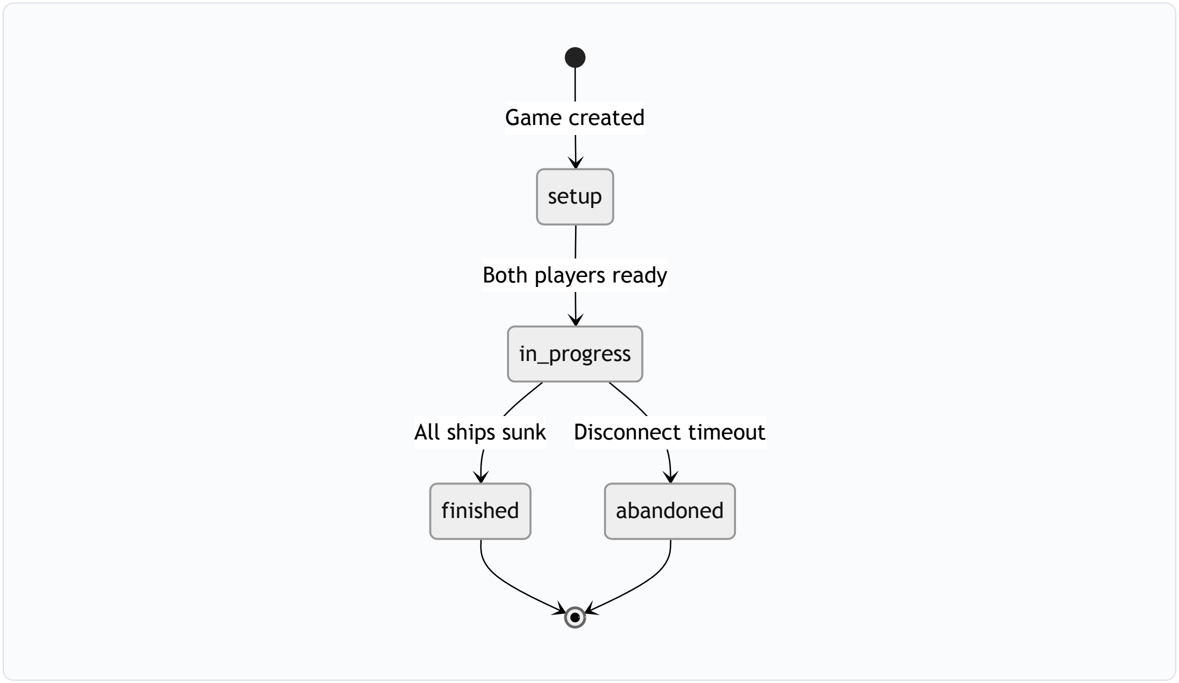
Column	Type	Constraints	Description
`id`	`uuid`	PK, FK → auth.users.id	User ID from Supabase Auth
`display_name`	`text`	NOT NULL, UNIQUE	Public username
`email`	`text`	NOT NULL, UNIQUE	User email
`avatar_url`	`text`	NULLABLE	Profile picture URL (future)
`total_games`	`integer`	DEFAULT 0	Total games played
`wins`	`integer`	DEFAULT 0	Total wins
`losses`	`integer`	DEFAULT 0	Total losses
`created_at`	`timestamptz`	DEFAULT now()	Registration date
`last_seen`	`timestamptz`	DEFAULT now()	Last activity timestamp

`games`

Core game table. One row per match.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Game ID
`table_id`	`uuid`	FK → tables.id, NULLABLE	Source table (null for quick match)
`status`	`text`	NOT NULL, DEFAULT 'setup'	`setup` / `in_progress` / `finished` / `abandoned`
`current_turn`	`uuid`	FK → profiles.id, NULLABLE	Player whose turn it is
`winner_id`	`uuid`	FK → profiles.id, NULLABLE	Winner (null until game ends)
`created_at`	`timestamptz`	DEFAULT now()	Game creation time
`started_at`	`timestamptz`	NULLABLE	When both players readied up
`ended_at`	`timestamptz`	NULLABLE	When game ended

Status Transitions:



`games_players`

Junction table linking players to games. Stores each player's board state.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Record ID
`game_id`	`uuid`	FK → games.id, NOT NULL	Game reference
`player_id`	`uuid`	FK → profiles.id, NOT NULL	Player reference
`board`	`jsonb`	NOT NULL, DEFAULT '{}'	Ship placement data
`ready`	`boolean`	DEFAULT false	Ship placement confirmed
`player_number`	`integer`	NOT NULL	1 or 2 (determines turn order)
`last_heartbeat`	`timestamptz`	DEFAULT now()	For disconnect detection

Board JSON Structure:

```
{
  "ships": [
    {
      "type": "carrier",
      "size": 5,
      "cells": [
        {"x": 2, "y": 0},
        {"x": 3, "y": 0},
        {"x": 4, "y": 0},
        {"x": 5, "y": 0},
        {"x": 6, "y": 0}
      ],
      "orientation": "horizontal",
      "sunk": false
    },
    {
      "type": "battleship",
      "size": 4,
      "cells": [
        {"x": 0, "y": 2},
        {"x": 0, "y": 3},
        {"x": 0, "y": 4},
        {"x": 0, "y": 5}
      ],
      "orientation": "vertical",
      "sunk": false
    }
  ]
}
```

`moves`

Every attack made during a game.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Move ID
`game_id`	`uuid`	FK → games.id, NOT NULL	Game reference
`player_id`	`uuid`	FK → profiles.id, NOT NULL	Attacker
`x`	`integer`	NOT NULL, CHECK (0–9)	Column (0=A, 9=J)
`y`	`integer`	NOT NULL, CHECK (0–9)	Row (0=1, 9=10)
`result`	`text`	NOT NULL	`hit` / `miss` / `sunk`
`sunk_ship`	`text`	NULLABLE	Ship type if sunk (e.g., “destroyer”)
`move_number`	`integer`	NOT NULL	Sequential move number
`created_at`	`timestamptz`	DEFAULT now()	Timestamp

Unique constraint: `(game_id, player_id, x, y)` — prevents attacking the same cell twice.

`tables`

Custom tables created by players in the lobby.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Table ID
`host_id`	`uuid`	FK → profiles.id, NOT NULL	Table creator
`status`	`text`	DEFAULT 'waiting'	`waiting` / `full` / `in_game` / `closed`
`created_at`	`timestamptz`	DEFAULT now()	Creation time

`table_requests`

Join requests for custom tables.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Request ID
`table_id`	`uuid`	FK → tables.id, NOT NULL	Target table
`requester_id`	`uuid`	FK → profiles.id, NOT NULL	Requesting player
`status`	`text`	DEFAULT 'pending'	`pending` / `accepted` / `rejected`
`created_at`	`timestamptz`	DEFAULT now()	Request time

`matchmaking_queue`

FIFO queue for Quick Match.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Entry ID
`player_id`	`uuid`	FK → profiles.id, UNIQUE	One entry per player
`joined_at`	`timestamptz`	DEFAULT now()	Queue entry time (FIFO ordering)

`chat_messages`

Lobby chat messages.

Column	Type	Constraints	Description
`id`	`uuid`	PK, DEFAULT gen_random_uuid()	Message ID
`sender_id`	`uuid`	FK → profiles.id, NOT NULL	Message author
`message`	`text`	NOT NULL, max 500 chars	Message content
`channel`	`text`	DEFAULT 'lobby'	Chat channel identifier
`created_at`	`timestamptz`	DEFAULT now()	Sent time

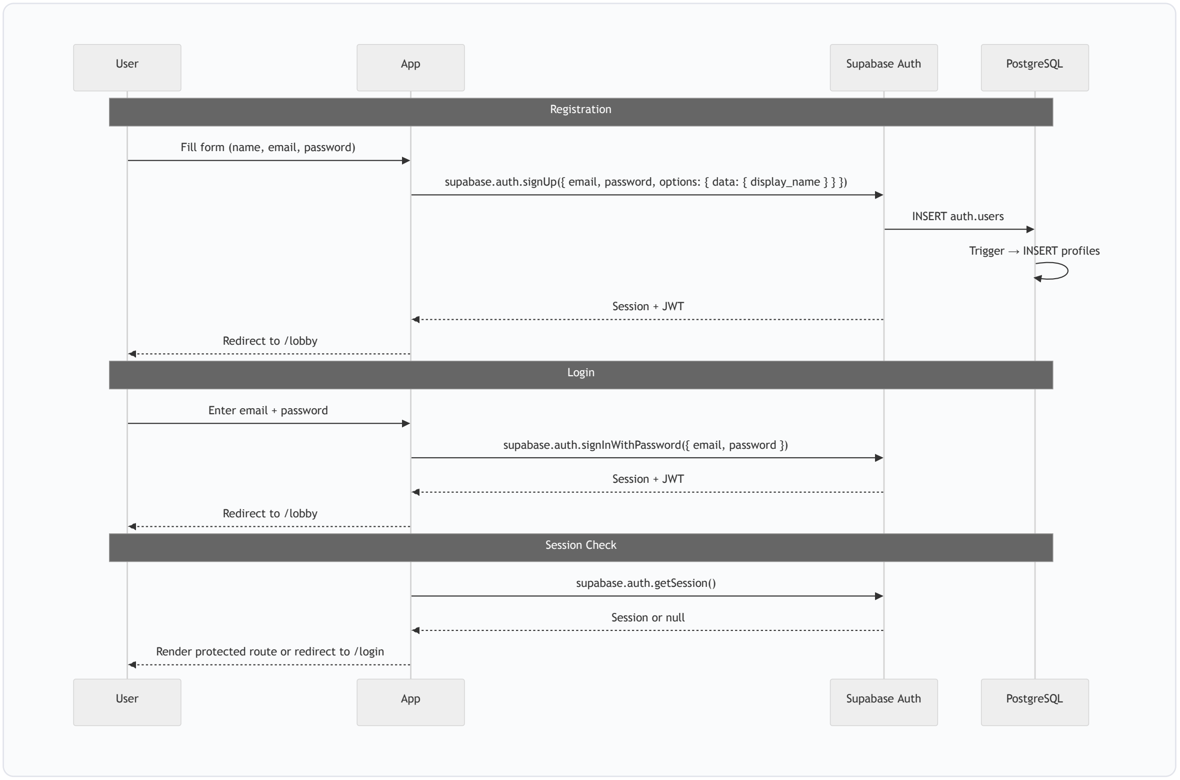
6.3 SQL Migration Script

```sql
-- Enable UUID extension
CREATE EXTENSION IF NOT EXISTS "uuid-ossp";

-- Profiles (extends auth.users)
CREATE TABLE profiles (
    id UUID PRIMARY KEY REFERENCES auth.users(id) ON DELETE CASCADE,
    display_name TEXT NOT NULL UNIQUE,
    email TEXT NOT NULL UNIQUE,
    avatar_url TEXT,
    total_games INTEGER DEFAULT 0,
    wins INTEGER DEFAULT 0,
    losses INTEGER DEFAULT 0,
    created_at TIMESTAMPTZ DEFAULT now(),
    last_seen TIMESTAMPTZ DEFAULT now()
);

-- Games
CREATE TABLE games (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    table_id UUID REFERENCES tables(id) ON DELETE SET NULL,
    status TEXT NOT NULL DEFAULT 'setup'
        CHECK (status IN ('setup', 'in_progress', 'finished', 'abandoned')),
    current_turn UUID REFERENCES profiles(id),
    winner_id UUID REFERENCES profiles(id),
    created_at TIMESTAMPTZ DEFAULT now(),
    started_at TIMESTAMPTZ,
    ended_at TIMESTAMPTZ
);

-- Games ↔ Players junction
CREATE TABLE games_players (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    game_id UUID NOT NULL REFERENCES games(id) ON DELETE CASCADE,
    player_id UUID NOT NULL REFERENCES profiles(id),
    board JSONB NOT NULL DEFAULT '{}'::jsonb,
    ready BOOLEAN DEFAULT false,
    player_number INTEGER NOT NULL CHECK (player_number IN (1, 2)),
    last_heartbeat TIMESTAMPTZ DEFAULT now(),
    UNIQUE (game_id, player_id),
    UNIQUE (game_id, player_number)
);

-- Moves
CREATE TABLE moves (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    game_id UUID NOT NULL REFERENCES games(id) ON DELETE CASCADE,
    player_id UUID NOT NULL REFERENCES profiles(id),
    x INTEGER NOT NULL CHECK (x BETWEEN 0 AND 9),
    y INTEGER NOT NULL CHECK (y BETWEEN 0 AND 9),
    result TEXT NOT NULL CHECK (result IN ('hit', 'miss', 'sunk')),
    sunk_ship TEXT,
    move_number INTEGER NOT NULL,
    created_at TIMESTAMPTZ DEFAULT now(),
    UNIQUE (game_id, player_id, x, y)
);

-- Custom Tables
CREATE TABLE tables (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    host_id UUID NOT NULL REFERENCES profiles(id),
    status TEXT DEFAULT 'waiting'
        CHECK (status IN ('waiting', 'full', 'in_game', 'closed')),
    created_at TIMESTAMPTZ DEFAULT now()
);

-- Table Join Requests
CREATE TABLE table_requests (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    table_id UUID NOT NULL REFERENCES tables(id) ON DELETE CASCADE,
    requester_id UUID NOT NULL REFERENCES profiles(id),
    status TEXT DEFAULT 'pending'
        CHECK (status IN ('pending', 'accepted', 'rejected')),
    created_at TIMESTAMPTZ DEFAULT now(),
    UNIQUE (table_id, requester_id)
);

-- Matchmaking Queue
CREATE TABLE matchmaking_queue (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    player_id UUID NOT NULL UNIQUE REFERENCES profiles(id),
    joined_at TIMESTAMPTZ DEFAULT now()
);

-- Chat Messages
CREATE TABLE chat_messages (
    id UUID PRIMARY KEY DEFAULT gen_random_uuid(),
    sender_id UUID NOT NULL REFERENCES profiles(id),
    message TEXT NOT NULL CHECK (char_length(message) ⩽ 500),
    channel TEXT DEFAULT 'lobby',
    created_at TIMESTAMPTZ DEFAULT now()
);

-- Indexes
CREATE INDEX idx_games_status ON games(status);
CREATE INDEX idx_moves_game ON moves(game_id, move_number);
CREATE INDEX idx_matchmaking_joined ON matchmaking_queue(joined_at ASC);
CREATE INDEX idx_tables_status ON tables(status);
CREATE INDEX idx_chat_channel_time ON chat_messages(channel, created_at DESC);
CREATE INDEX idx_table_requests_table ON table_requests(table_id, status);

-- Auto-create profile on signup
CREATE OR REPLACE FUNCTION handle_new_user()
RETURNS TRIGGER AS $$
BEGIN
    INSERT INTO profiles (id, email, display_name)
    VALUES (
        NEW.id,
        NEW.email,
        NEW.raw_user_meta_data->>'display_name'
    );
    RETURN NEW;
END;
$$ LANGUAGE plpgsql SECURITY DEFINER;

CREATE TRIGGER on_auth_user_created
    AFTER INSERT ON auth.users
    FOR EACH ROW EXECUTE FUNCTION handle_new_user();
```

---

7. Authentication System

7.1 Auth Flow


User
App
Supabase Auth
PostgreSQL
Registration
Fill form (name, email, password)
supabase.auth.signUp({ email, password, options: { data: { display_name } } })
INSERT auth.users
Trigger → INSERT profiles
Session + JWT
Redirect to /lobby
Login
Enter email + password
supabase.auth.signInWithPassword({ email, password })
Session + JWT
Redirect to /lobby
Session Check
supabase.auth.getSession()
Session or null
Render protected route or redirect to /login
User
App
Supabase Auth
PostgreSQL

7.2 Auth Context (React)

```
// src/contexts/AuthContext.tsx
interface AuthContextType {
  user: User | null;
  profile: Profile | null;
  loading: boolean;
  signUp: (email: string, password: string, displayName: string) => Promise<void>;
  signIn: (email: string, password: string) => Promise<void>;
  signOut: () => Promise<void>;
}
```

7.3 Protected Route Pattern

```
// src/components/ProtectedRoute.tsx
const ProtectedRoute = ({ children }: { children: ReactNode }) => {
  const { user, loading } = useAuth();
  if (loading) return <LoadingSpinner />;
  if (!user) return <Navigate to="/login" replace />;
  return <>{children}</>;
};
```

---

8. Lobby System

8.1 Lobby State Machine

Syntax error in text
mermaid version 11.12.2

8.2 Presence Tracking

Supabase Presence is used to track who is in the lobby and their current status.

```
// Presence payload structure
interface PresenceState {
  user_id: string;
  display_name: string;
  status: 'idle' | 'in_queue' | 'hosting_table' | 'in_game';
  joined_at: string;
}
```

Channel subscription:

```
const lobbyChannel = supabase.channel('lobby', {
  config: { presence: { key: userId } }
});

lobbyChannel
  .on('presence', { event: 'sync' }, () => {
    const state = lobbyChannel.presenceState();
    // Update lobby stats from state
  })
  .on('presence', { event: 'join' }, ({ key, newPresences }) => {
    // Player joined lobby
  })
  .on('presence', { event: 'leave' }, ({ key, leftPresences }) => {
    // Player left lobby
  })
  .subscribe(async (status) => {
    if (status === 'SUBSCRIBED') {
      await lobbyChannel.track({
        user_id: userId,
        display_name: displayName,
        status: 'idle',
        joined_at: new Date().toISOString()
      });
    }
  });
```

8.3 Lobby Chat

Real-time chat using Supabase Realtime subscriptions on the `chat_messages` table.

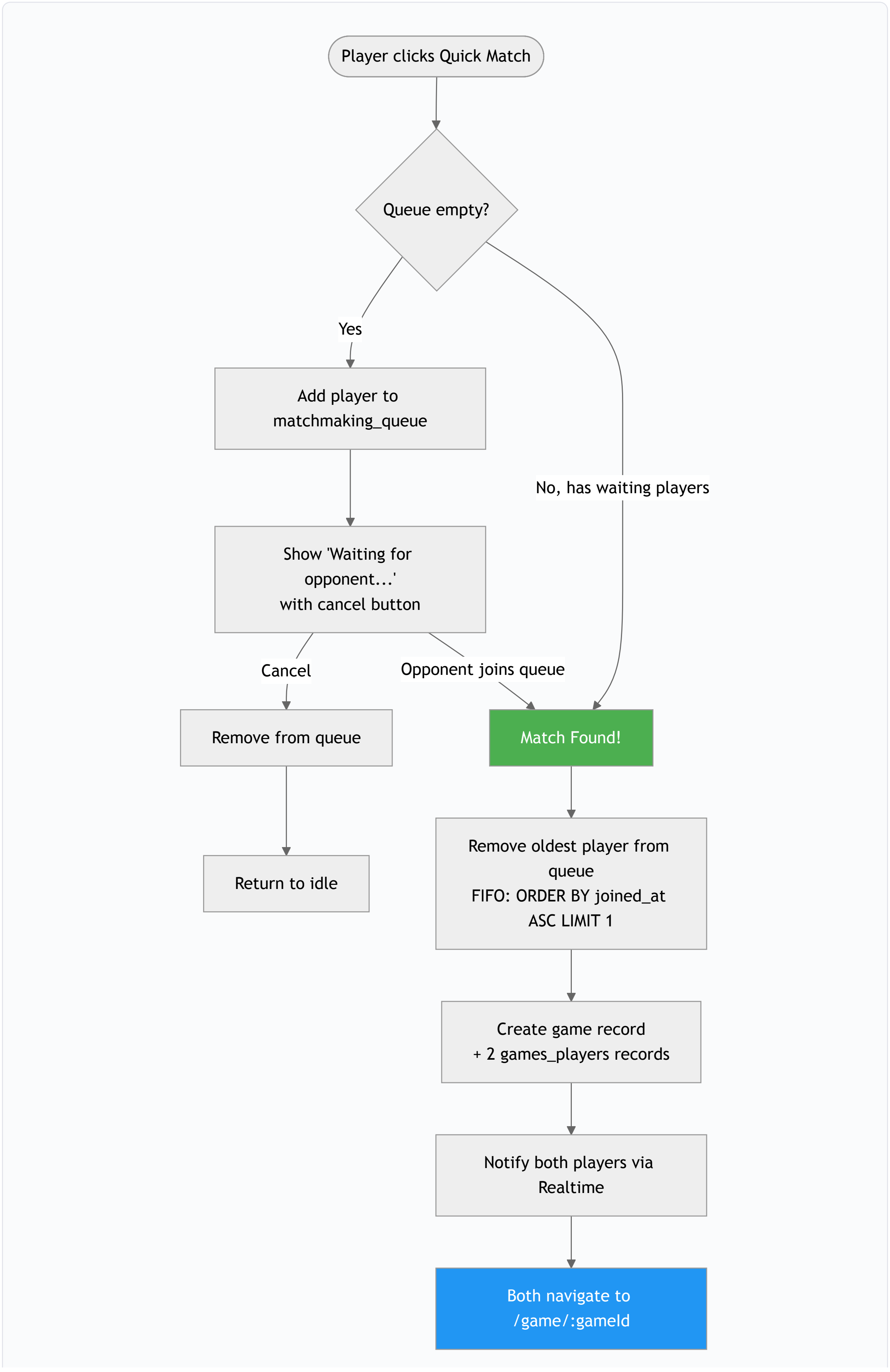
```
// Subscribe to new messages
supabase
  .channel('lobby-chat')
  .on(
    'postgres_changes',
    { event: 'INSERT', schema: 'public', table: 'chat_messages', filter: 'channel=eq.lobby' },
    (payload) => {
      // Append new message to chat list
    }
  )
  .subscribe();

// Send a message
const sendMessage = async (text: string) => {
  await supabase.from('chat_messages').insert({
    sender_id: userId,
    message: text,
    channel: 'lobby'
  });
};
```

Chat Rules: - Max 500 characters per message - Load last 50 messages on lobby entry - Auto-scroll to latest message - Display sender name and timestamp - Basic profanity filter (optional, future)

---

9. Matchmaking Engine

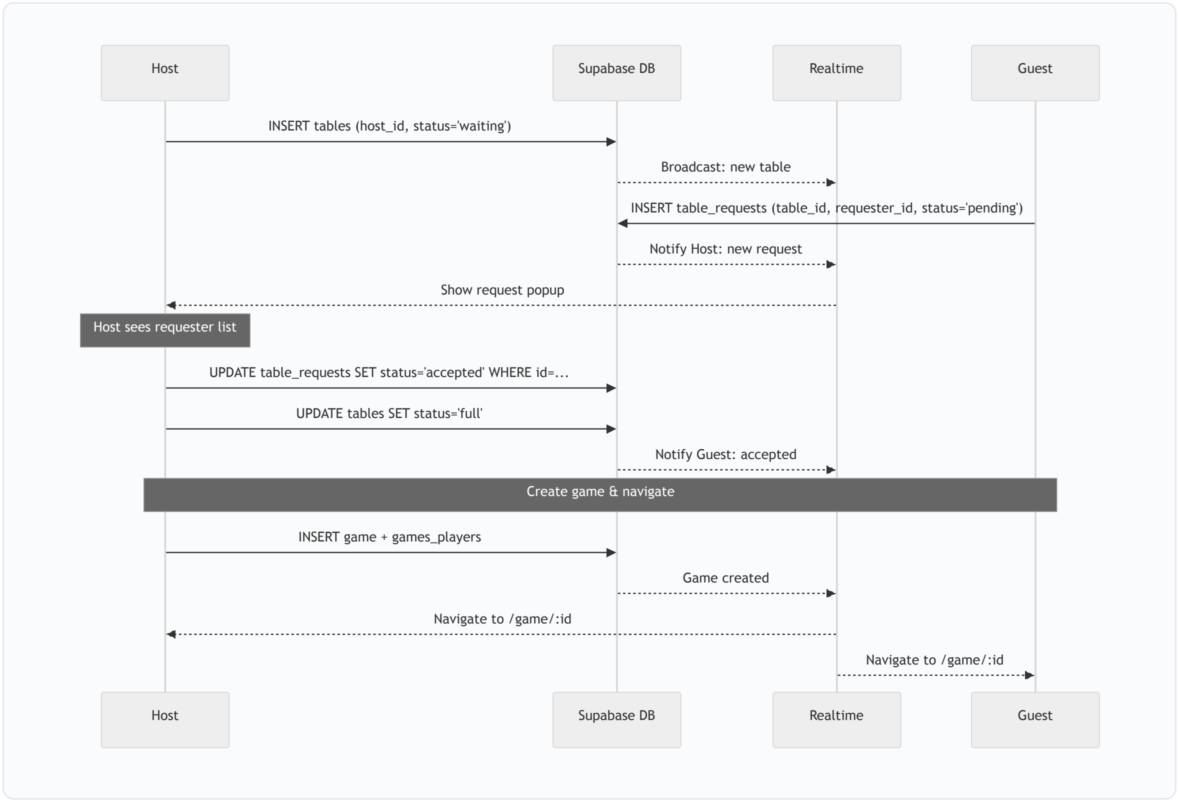
9.1 Quick Match Flow


Player clicks Quick Match
Queue empty?
Yes
No, has waiting players
Add player to matchmaking_queue
Show 'Waiting for opponent...' with cancel button
Cancel
Opponent joins queue
Remove from queue
Return to idle
Match Found!
Remove oldest player from queue FIFO: ORDER BY joined_at ASC LIMIT 1
Create game record + 2 games_players records
Notify both players via Realtime
Both navigate to /game/:gameId

9.2 Matchmaking Logic (Client-Side)

```
const quickMatch = async (playerId: string) => {
  // Step 1: Check for waiting players (FIFO)
  const { data: waitingPlayer } = await supabase
    .from('matchmaking_queue')
    .select('*')
    .order('joined_at', { ascending: true })
    .limit(1)
    .single();

  if (waitingPlayer) {
    // Step 2a: Match found — remove from queue and create game
    await supabase
      .from('matchmaking_queue')
      .delete()
      .eq('id', waitingPlayer.id);

    const game = await createGame(waitingPlayer.player_id, playerId);
    return game;
  } else {
    // Step 2b: No one waiting — join queue
    await supabase
      .from('matchmaking_queue')
      .insert({ player_id: playerId });

    // Listen for game creation (another player will match with us)
    return null; // caller sets up realtime listener
  }
};
```

9.3 Custom Table Flow


Host
Supabase DB
Realtime
Guest
INSERT tables (host_id, status='waiting')
Broadcast: new table
INSERT table_requests (table_id, requester_id, status='pending')
Notify Host: new request
Show request popup
Host sees requester list
UPDATE table_requests SET status='accepted' WHERE id=...
UPDATE tables SET status='full'
Notify Guest: accepted
Create game & navigate
INSERT game + games_players
Game created
Navigate to /game/:id
Navigate to /game/:id

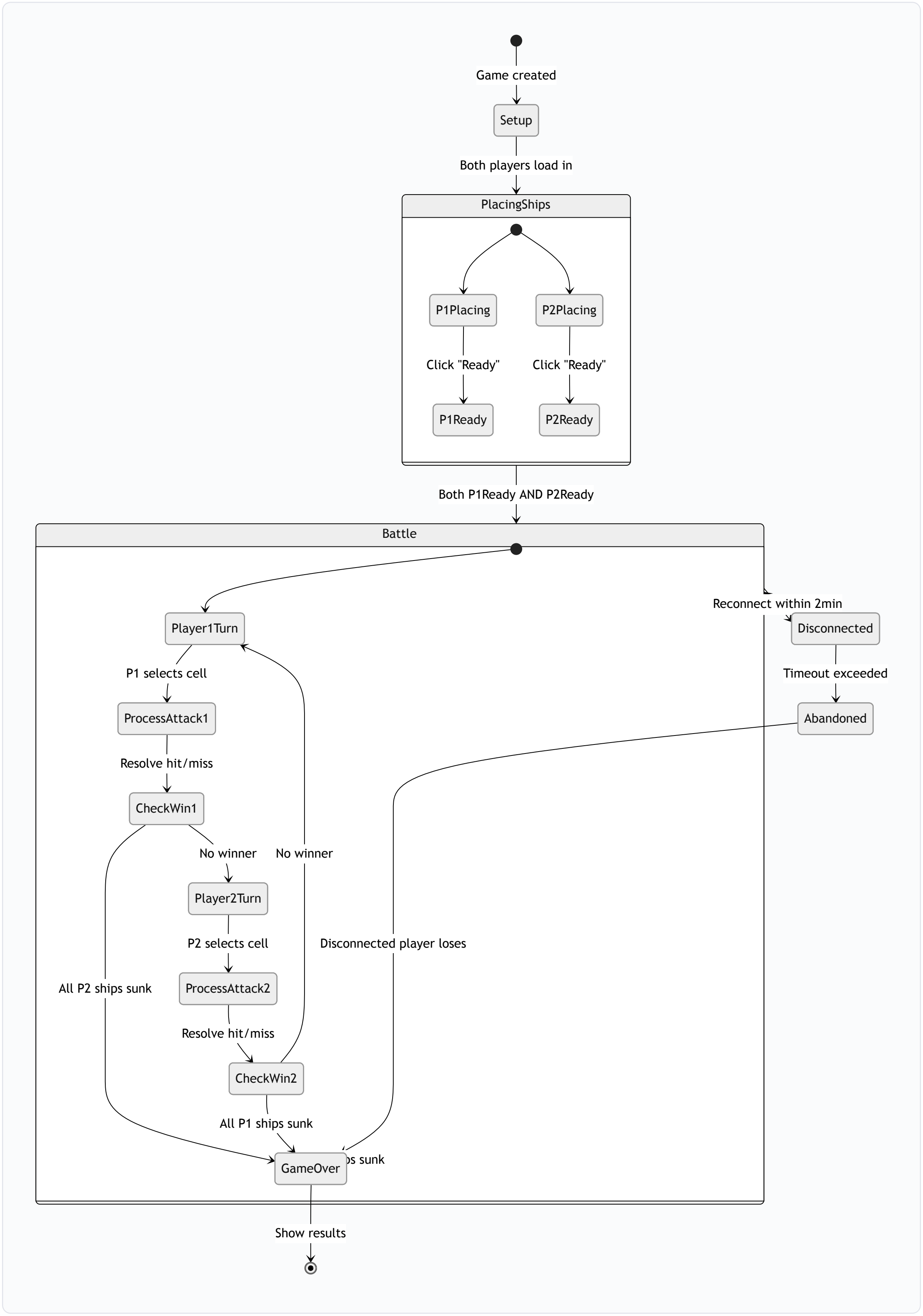
Host Request Management UI:

```
┌──────────────────────────────┐
│  Your Table — Waiting...     │
│                              │
│  Join Requests:              │
│  ┌──────────────────────┐    │
│  │ 👤 PlayerX           │    │
│  │ [✓ Accept] [✗ Reject]  │    │
│  ├──────────────────────┤    │
│  │ 👤 PlayerY           │    │
│  │ [✓ Accept] [✗ Reject]  │    │
│  └──────────────────────┘    │
│                              │
│  [Cancel Table]              │
└──────────────────────────────┘
```

-

10. Game Mechanics

10.1 Game State Machine



10.2 Ship Placement Validation

```
interface Ship {
  type: 'carrier' | 'battleship' | 'cruiser' | 'submarine' | 'destroyer';
  size: number;
  cells: { x: number; y: number }[];
  orientation: 'horizontal' | 'vertical';
}

const SHIP_SIZES: Record<string, number> = {
  carrier: 5,
  battleship: 4,
  cruiser: 3,
  submarine: 3,
  destroyer: 2,
};

function validatePlacement(ships: Ship[]): boolean {
  // 1. Exactly 5 ships
  if (ships.length !== 5) return false;

  // 2. Correct ship types and sizes
  for (const ship of ships) {
    if (ship.cells.length !== SHIP_SIZES[ship.type]) return false;
  }

  // 3. All cells within 0-9 bounds
  const allCells = ships.flatMap(s => s.cells);
  if (allCells.some(c => c.x < 0 || c.x > 9 || c.y < 0 || c.y > 9)) return false;

  // 4. No overlapping cells
  const cellKeys = allCells.map(c => `${c.x},${c.y}`);
  if (new Set(cellKeys).size !== cellKeys.length) return false;

  // 5. Cells are contiguous (horizontal or vertical line)
  for (const ship of ships) {
    const sorted = [...ship.cells].sort((a, b) =>
      ship.orientation === 'horizontal' ? a.x - b.x : a.y - b.y
    );
    for (let i = 1; i < sorted.length; i++) {
      if (ship.orientation === 'horizontal') {
        if (sorted[i].x !== sorted[i-1].x + 1 || sorted[i].y !== sorted[0].y) return false;
      } else {
        if (sorted[i].y !== sorted[i-1].y + 1 || sorted[i].x !== sorted[0].x) return false;
      }
    }
  }

  return true;
}
```

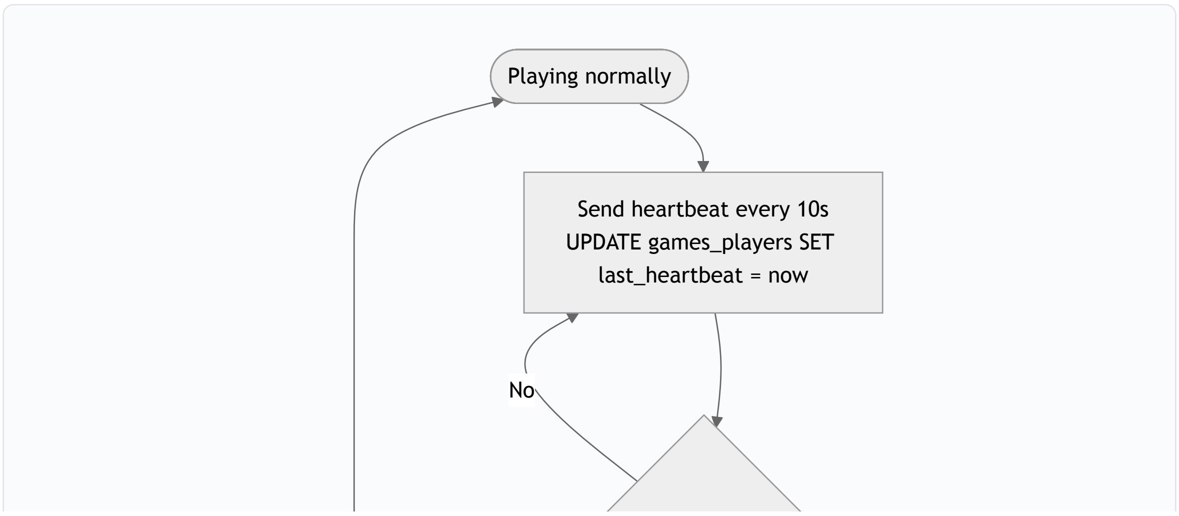
10.3 Attack Resolution

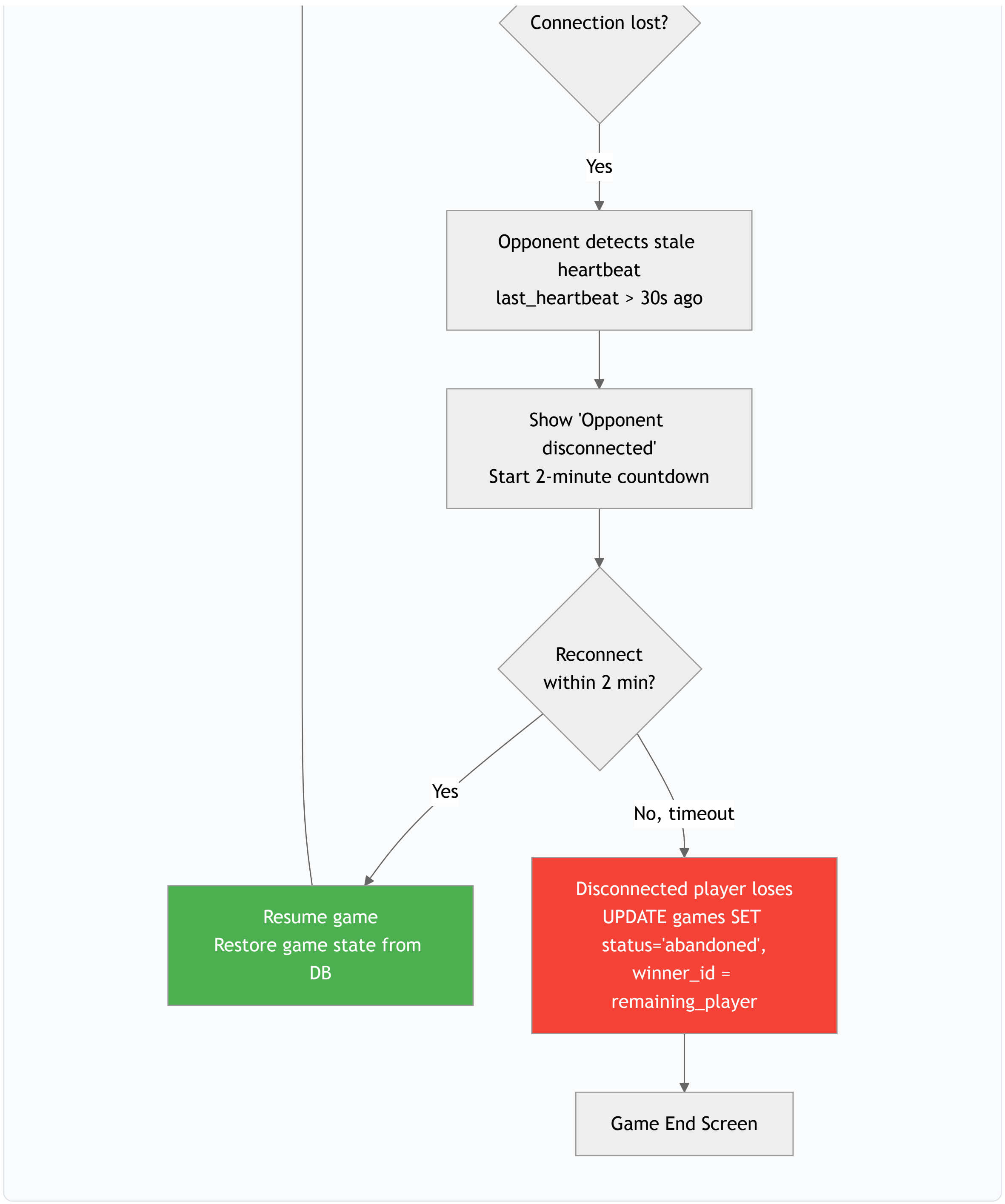
```
interface AttackResult {
  x: number;
  y: number;
  result: 'hit' | 'miss' | 'sunk';
  sunkShip?: string; // ship type if sunk
}

function resolveAttack(
  board: { ships: Ship[] },
  x: number,
  y: number
): AttackResult {
  for (const ship of board.ships) {
    const hitCell = ship.cells.find(c => c.x === x && c.y === y);
    if (hitCell) {
      // Check if this sinks the ship
      // (all other cells of this ship have been hit in previous moves)
      const allHit = ship.cells.every(
        c => (c.x === x && c.y === y) || previouslyHit(c.x, c.y)
      );

      if (allHit) {
        ship.sunk = true;
        return { x, y, result: 'sunk', sunkShip: ship.type };
      }
      return { x, y, result: 'hit' };
    }
  }
  return { x, y, result: 'miss' };
}
```

10.4 Win Condition Check

```
function checkWin(board: { ships: Ship[] }): boolean {
  return board.ships.every(ship => ship.sunk);
}
```

10.5 Disconnect & Reconnect




Connection lost?
Yes
Opponent detects stale heartbeat last_heartbeat > 30s ago
Show 'Opponent disconnected' Start 2-minute countdown
Reconnect within 2 min?
Yes
No, timeout
Resume game Restore game state from DB
Disconnected player loses UPDATE games SET status='abandoned', winner_id = remaining_player
Game End Screen

---

11. Realtime Event System

11.1 Channel Architecture

Channel	Type	Purpose	Subscribers
`lobby`	Presence	Track online users, status	All lobby users
`lobby-chat`	Postgres Changes	Chat messages	All lobby users
`lobby-tables`	Postgres Changes	Table create/update/delete	All lobby users
`table:{tableId}`	Postgres Changes	Join requests for specific table	Table host
`matchmaking`	Postgres Changes	Queue changes, match notifications	Queued players
`game:{gameId}`	Postgres Changes	Moves, ready status, game state	Both game players
`game:{gameId}:presence`	Presence	Heartbeat, disconnect detection	Both game players

11.2 Event Catalog

Lobby Events

Event	Trigger	Payload	Listeners
`presence:sync`	Any user joins/leaves lobby	Full presence state	All lobby users
`chat:new_message`	INSERT on chat_messages	`{ sender, message, created_at }`	All lobby users
`table:created`	INSERT on tables	`{ table_id, host_name }`	All lobby users
`table:closed`	UPDATE/DELETE on tables	`{ table_id }`	All lobby users
`request:received`	INSERT on table_requests	`{ requester_name }`	Table host
`request:resolved`	UPDATE on table_requests	`{ status }`	Requester
`match:found`	Game created from queue	`{ game_id }`	Matched players

Game Events

Event	Trigger	Payload	Listeners
`player:ready`	UPDATE games_players ready=true	`{ player_id }`	Both players
`game:started`	UPDATE games status='in_progress'	`{ current_turn }`	Both players
`move:made`	INSERT on moves	`{ player_id, x, y, result, sunk_ship }`	Both players
`turn:changed`	UPDATE games current_turn	`{ current_turn }`	Both players
`game:over`	UPDATE games status='finished'	`{ winner_id, stats }`	Both players
`player:disconnected`	Presence leave	`{ player_id }`	Remaining player
`player:reconnected`	Presence join	`{ player_id }`	Remaining player

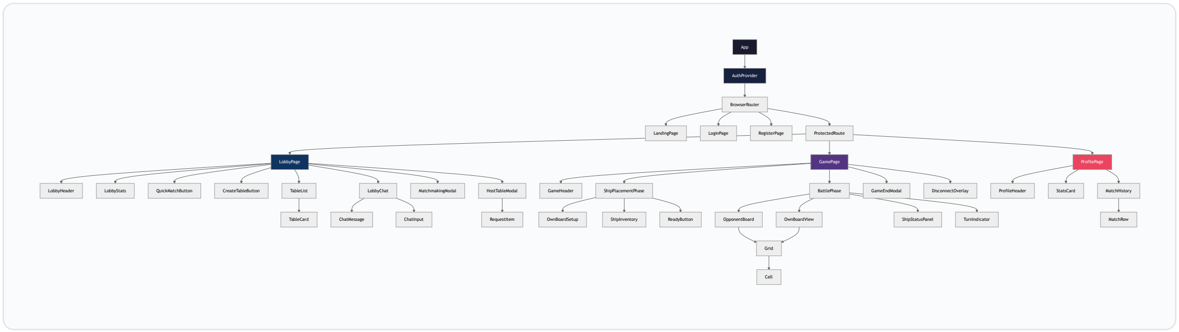
11.3 Subscription Setup Example

```
// Game channel setup
const gameChannel = supabase.channel(`game:${gameId}`);

gameChannel
  // Listen for new moves
  .on(
    'postgres_changes',
    { event: 'INSERT', schema: 'public', table: 'moves', filter: `game_id=eq.${gameId}` },
    (payload) => handleNewMove(payload.new as Move)
  )
  // Listen for game state changes
  .on(
    'postgres_changes',
    { event: 'UPDATE', schema: 'public', table: 'games', filter: `id=eq.${gameId}` },
    (payload) => handleGameUpdate(payload.new as Game)
  )
  // Listen for player ready status
  .on(
    'postgres_changes',
    { event: 'UPDATE', schema: 'public', table: 'games_players', filter: `game_id=eq.${gameId}` },
    (payload) => handlePlayerUpdate(payload.new as GamePlayer)
  )
  .subscribe();
```

-

12. React Component Architecture

12.1 Component Tree



12.2 Key Component Specifications

Component	Props	State	Realtime?
`LobbyStats`	—	`{ online, playing, waiting }`	Yes (Presence)
`QuickMatchButton`	`onMatch(gameId)`	`{ isSearching }`	Yes (Queue)
`TableList`	—	`{ tables: Table[] }`	Yes (DB changes)
`LobbyChat`	—	`{ messages: Message[] }`	Yes (DB changes)
`HostTableModal`	`tableId`	`{ requests: Request[] }`	Yes (DB changes)
`Grid`	`size, cells, onClick, interactive`	—	—
`Cell`	`x, y, state, onClick`	—	—
`ShipPlacementPhase`	`gameId`	`{ ships, selectedShip, orientation }`	Yes (ready status)
`BattlePhase`	`gameId`	`{ myBoard, opponentBoard, myTurn }`	Yes (moves)
`TurnIndicator`	`isMyTurn`	—	—
`DisconnectOverlay`	`remainingTime`	`{ countdown }`	Yes (Presence)
`GameEndModal`	`result, stats`	—	—

12.3 Project File Structure

```
src/
├── main.tsx                # Entry point
├── App.tsx                 # Router setup
├── vite-env.d.ts
│
```

```
  ├── config/
  │   └── supabase.ts             # Supabase client init
  │
  ├── contexts/
  │   ├── AuthContext.tsx          # Auth state provider
  │   └── GameContext.tsx          # Game state provider
  │
  ├── hooks/
  │   ├── useAuth.ts              # Auth hook
  │   ├── useLobby.ts             # Lobby presence & stats
  │   ├── useChat.ts              # Lobby chat
  │   ├── useMatchmaking.ts       # Queue management
  │   ├── useTable.ts             # Custom table management
  │   ├── useGame.ts              # Game state & moves
  │   ├── usePresence.ts          # Generic presence hook
  │   └── useHeartbeat.ts         # Disconnect detection
  │
  ├── pages/
  │   ├── LandingPage.tsx
  │   ├── LoginPage.tsx
  │   ├── RegisterPage.tsx
  │   ├── LobbyPage.tsx
  │   ├── GamePage.tsx
  │   └── ProfilePage.tsx
  │
  ├── components/
  │   ├── common/
  │   │   ├── Button.tsx
  │   │   ├── Input.tsx
  │   │   ├── Modal.tsx
  │   │   ├── LoadingSpinner.tsx
  │   │   ├── ProtectedRoute.tsx
  │   │   └── Navbar.tsx
  │   │
  │   ├── lobby/
  │   │   ├── LobbyHeader.tsx
  │   │   ├── LobbyStats.tsx
  │   │   ├── QuickMatchButton.tsx
  │   │   ├── CreateTableButton.tsx
  │   │   ├── TableList.tsx
  │   │   ├── TableCard.tsx
  │   │   ├── MatchmakingModal.tsx
  │   │   ├── HostTableModal.tsx
  │   │   ├── RequestItem.tsx
  │   │   ├── LobbyChat.tsx
  │   │   ├── ChatMessage.tsx
  │   │   └── ChatInput.tsx
  │   │
  │   ├── game/
  │   │   ├── GameHeader.tsx
  │   │   ├── Grid.tsx
  │   │   ├── Cell.tsx
  │   │   ├── ShipPlacementPhase.tsx
  │   │   ├── ShipInventory.tsx
  │   │   ├── BattlePhase.tsx
  │   │   ├── OpponentBoard.tsx
  │   │   ├── OwnBoardView.tsx
  │   │   ├── ShipStatusPanel.tsx
  │   │   ├── TurnIndicator.tsx
  │   │   ├── DisconnectOverlay.tsx
  │   │   └── GameEndModal.tsx
  │   │
```

```
│   └── profile/
│       ├── ProfileHeader.tsx
│       ├── StatsCard.tsx
│       ├── MatchHistory.tsx
│       └── MatchRow.tsx
│
├── lib/
│   ├── gameLogic.ts            # Ship placement, attack resolution, win check
│   ├── matchmaking.ts          # Queue operations
│   └── constants.ts            # Ship sizes, grid size, timing constants
│
├── types/
│   └── index.ts                # TypeScript interfaces
│
└── styles/
    └── index.css               # Tailwind imports + custom styles
```

-

13. API & Supabase Functions

13.1 Core Database Operations

Operation	Method	Table	Used By
Register profile	Trigger (auto)	`profiles`	Auth trigger
Get profile	SELECT	`profiles`	Profile page, lobby
Update last_seen	UPDATE	`profiles`	Lobby presence
Join matchmaking	INSERT	`matchmaking_queue`	Quick Match
Leave matchmaking	DELETE	`matchmaking_queue`	Cancel queue
Pop oldest in queue	SELECT + DELETE	`matchmaking_queue`	Quick Match
Create table	INSERT	`tables`	Create Table
List open tables	SELECT	`tables`	Lobby
Send join request	INSERT	`table_requests`	Join Table
Accept/Reject request	UPDATE	`table_requests`	Host
Create game	INSERT	`games` + `games_players`	Matchmaking
Submit ship placement	UPDATE	`games_players`	Ship placement
Set player ready	UPDATE	`games_players`	Ready button
Make move	INSERT	`moves`	Battle phase
Update game state	UPDATE	`games`	Turn change, game over
Update stats	UPDATE	`profiles`	Game end
Send chat message	INSERT	`chat_messages`	Lobby chat
Load chat history	SELECT	`chat_messages`	Lobby entry
Heartbeat	UPDATE	`games_players`	During game

13.2 Type Definitions

```
// src/types/index.ts

export type GameStatus = 'setup' | 'in_progress' | 'finished' | 'abandoned';
export type MoveResult = 'hit' | 'miss' | 'sunk';
export type TableStatus = 'waiting' | 'full' | 'in_game' | 'closed';
export type RequestStatus = 'pending' | 'accepted' | 'rejected';
export type ShipType = 'carrier' | 'battleship' | 'cruiser' | 'submarine' | 'destroyer';
export type Orientation = 'horizontal' | 'vertical';
export type CellState = 'empty' | 'ship' | 'hit' | 'miss' | 'sunk';

export interface Profile {
  id: string;
  display_name: string;
  email: string;
  avatar_url: string | null;
  total_games: number;
  wins: number;
  losses: number;
  created_at: string;
  last_seen: string;
}

export interface Game {
  id: string;
  table_id: string | null;
  status: GameStatus;
  current_turn: string | null;
  winner_id: string | null;
  created_at: string;
  started_at: string | null;
  ended_at: string | null;
}

export interface GamePlayer {
  id: string;
  game_id: string;
  player_id: string;
  board: BoardState;
  ready: boolean;
  player_number: 1 | 2;
  last_heartbeat: string;
}

export interface BoardState {
  ships: Ship[];
}

export interface Ship {
  type: ShipType;
  size: number;
  cells: Coordinate[];
  orientation: Orientation;
  sunk: boolean;
}

export interface Coordinate {
  x: number; // 0-9 (columns A-J)
  y: number; // 0-9 (rows 1-10)
}

export interface Move {
  id: string;
  game_id: string;
  player_id: string;
  x: number;
  y: number;
  result: MoveResult;
  sunk_ship: ShipType | null;
  move_number: number;
  created_at: string;
}

export interface Table {
  id: string;
```

```
    host_id: string;
    host_name?: string; // joined from profiles
    status: TableStatus;
    created_at: string;
  }

  export interface TableRequest {
    id: string;
    table_id: string;
    requester_id: string;
    requester_name?: string; // joined from profiles
    status: RequestStatus;
    created_at: string;
  }

  export interface ChatMessage {
    id: string;
    sender_id: string;
    sender_name?: string; // joined from profiles
    message: string;
    channel: string;
    created_at: string;
  }
```

14. Responsive Design Strategy

14.1 Breakpoints (Tailwind Defaults)

Breakpoint	Min Width	Target
`sm`	640px	Large phones (landscape)
`md`	768px	Tablets
`lg`	1024px	Small laptops
`xl`	1280px	Desktops

14.2 Layout Adaptations

Page	Desktop (lg+)	Tablet (md)	Mobile (sm)
Landing	Full hero + features grid	Stacked hero + features	Single column, smaller hero
Lobby	2-column (stats+tables / chat)	2-column compressed	Single column, tabbed sections
Game (Setup)	Board + ship panel side by side	Stacked	Stacked, smaller grid
Game (Battle)	Both boards side by side	Tab toggle between boards	Tab toggle, full-width board
Profile	Wide stats + history table	Compressed table	Card layout for history

14.3 Game Board Responsive Sizing

```
/* Grid cell sizes */
.cell {
  @apply w-8 h-8 lg:w-10 lg:h-10;  /* 32px mobile, 40px desktop */
}

/* Full board = 10 cells + gaps */
/* Mobile: ~340px wide */
/* Desktop: ~420px wide */
```

14.4 Mobile Game View Toggle

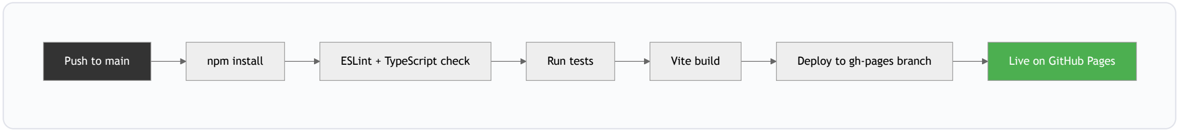
On mobile, both boards cannot fit side by side. Use a tab system:

```
┌───────────────────────────┐
│ [Enemy Board] [My Board] │  ← Tab toggle
├───────────────────────────┤
│                           │
│   Currently active board │
│   (full width, 10x10)   │
│                           │
├───────────────────────────┤
│ Ship Status | Turn Info  │
└───────────────────────────┘
```

---

15. CI/CD Pipeline

15.1 GitHub Actions Workflow



15.2 Workflow File

```yaml
# .github/workflows/deploy.yml
name: Deploy to GitHub Pages

on:
  push:
    branches: [main]
  pull_request:
    branches: [main]

permissions:
  contents: read
  pages: write
  id-token: write

concurrency:
  group: "pages"
  cancel-in-progress: false

jobs:
  build:
    runs-on: ubuntu-latest
    steps:
      - name: Checkout
        uses: actions/checkout@v4

      - name: Setup Node
        uses: actions/setup-node@v4
        with:
          node-version: 20
          cache: 'npm'

      - name: Install dependencies
        run: npm ci

      - name: Type check
        run: npx tsc --noEmit

      - name: Lint
        run: npx eslint src/ --ext .ts,.tsx

      - name: Build
        run: npm run build
        env:
          VITE_SUPABASE_URL: ${{ secrets.VITE_SUPABASE_URL }}
          VITE_SUPABASE_ANON_KEY: ${{ secrets.VITE_SUPABASE_ANON_KEY }}

      - name: Upload artifact
        uses: actions/upload-pages-artifact@v3
        with:
          path: dist

  deploy:
    if: github.ref == 'refs/heads/main'
    needs: build
    runs-on: ubuntu-latest
    environment:
      name: github-pages
      url: ${{ steps.deployment.outputs.page_url }}
    steps:
      - name: Deploy to GitHub Pages
        id: deployment
        uses: actions/deploy-pages@v4
```

15.3 Vite Configuration for GitHub Pages

```
// vite.config.ts
import { defineConfig } from 'vite';
import react from '@vitejs/plugin-react';

export default defineConfig({
  plugins: [react()],
  base: '/battleship/',  // repo name
  build: {
    outDir: 'dist',
    sourcemap: false,
  },
});
```

15.4 SPA Routing Fix for GitHub Pages

GitHub Pages doesn't support client-side routing natively. Add a `404.html` redirect:

```
<!-- public/404.html -->
<!DOCTYPE html>
<html>
<head>
  <script>
    // Redirect all 404s to index.html with the path preserved
    const path = window.location.pathname;
    window.location.replace(window.location.origin + '/battleship/?redirect=' + encodeURIComponent(path));
  </script>
</head>
</html>
```

And handle it in `App.tsx`:

```
useEffect(() => {
  const params = new URLSearchParams(window.location.search);
  const redirect = params.get('redirect');
  if (redirect) {
    window.history.replaceState(null, '', redirect);
  }
}, []);
```

---

16. Security Considerations

16.1 Client-Side Security Model

Since the team opted for client-side security (no Supabase RLS), the following measures apply:

Risk	Mitigation
Opponent reading ship positions	Board data is only written to DB when player is ready; opponent's board query is blocked by application logic (not DB-level). **Note:** A determined user could still query Supabase directly.
Move validation	Client validates: correct turn, cell not already attacked, game in progress. Ideally, a Supabase Edge Function would validate server-side for production.
Chat abuse	Max 500 chars, rate limit on client (1 msg/sec)
Auth token exposure	Supabase anon key is public (by design); auth tokens are JWTs managed by Supabase SDK
XSS in chat	React auto-escapes rendered text; no `dangerouslySetInnerHTML`

16.2 Environment Variables

```
# .env (local development, NOT committed)
VITE_SUPABASE_URL=https://xxxxx.supabase.co
VITE_SUPABASE_ANON_KEY=eyJhbGciOiJIUzI1NiIs...

# GitHub Secrets (for CI/CD)
# Set in repo Settings → Secrets → Actions
VITE_SUPABASE_URL
VITE_SUPABASE_ANON_KEY
```

16.3 Known Limitations

⚠️ **Academic Project Disclaimer**

This is a course project (CSC 710) with a 2.5-week timeline. The following are known security trade-offs made for development speed:

1. **No RLS policies** — opponent board data is theoretically accessible via direct Supabase queries. In a production app, RLS policies would restrict read access so that a player can only see their own board and the moves made against them.
2. **No server-side move validation** — moves are validated client-side only. A Supabase Edge Function or database trigger should validate moves in production.
3. **No rate limiting** — chat and move submissions have client-side throttling but no server-side enforcement.

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17. Error Handling & Edge Cases

17.1 Error Scenarios

Scenario	Detection	User Experience	Recovery
Login failure	Supabase Auth error	Toast: "Invalid email or password"	Retry
Registration: duplicate email	Supabase Auth error	Inline error under email field	Change email
Registration: duplicate name	DB unique constraint	Inline error under name field	Change name
Matchmaking: no opponent	Queue check returns empty	"Waiting for opponent..." modal with spinner	Cancel button → return to idle
Table request rejected	Realtime update	Toast: "Request rejected by host"	Return to table list
Ship placement invalid	Client validation	Highlight invalid cells in red	Fix placement
Attack own cell already hit	Client check	Cell is non-interactive (disabled)	Pick another cell
Opponent disconnects	Presence leave event	"Opponent disconnected. Waiting 2:00..." overlay	Auto-win on timeout or resume on reconnect
Own disconnect	`navigator.onLine` + Supabase reconnect	"Connection lost. Reconnecting..." overlay	Auto-reconnect via Supabase SDK
Supabase down	Fetch errors	Full-screen error page: "Service unavailable"	Retry button
Browser tab closed mid-game	Heartbeat stops	Opponent sees disconnect flow	Player can reopen and navigate to `/game/:id`
Concurrent matchmaking race	Two players pop same queue entry	Use `DELETE ... RETURNING` for atomic pop	Only one succeeds; other retries

17.2 Reconnection Strategy

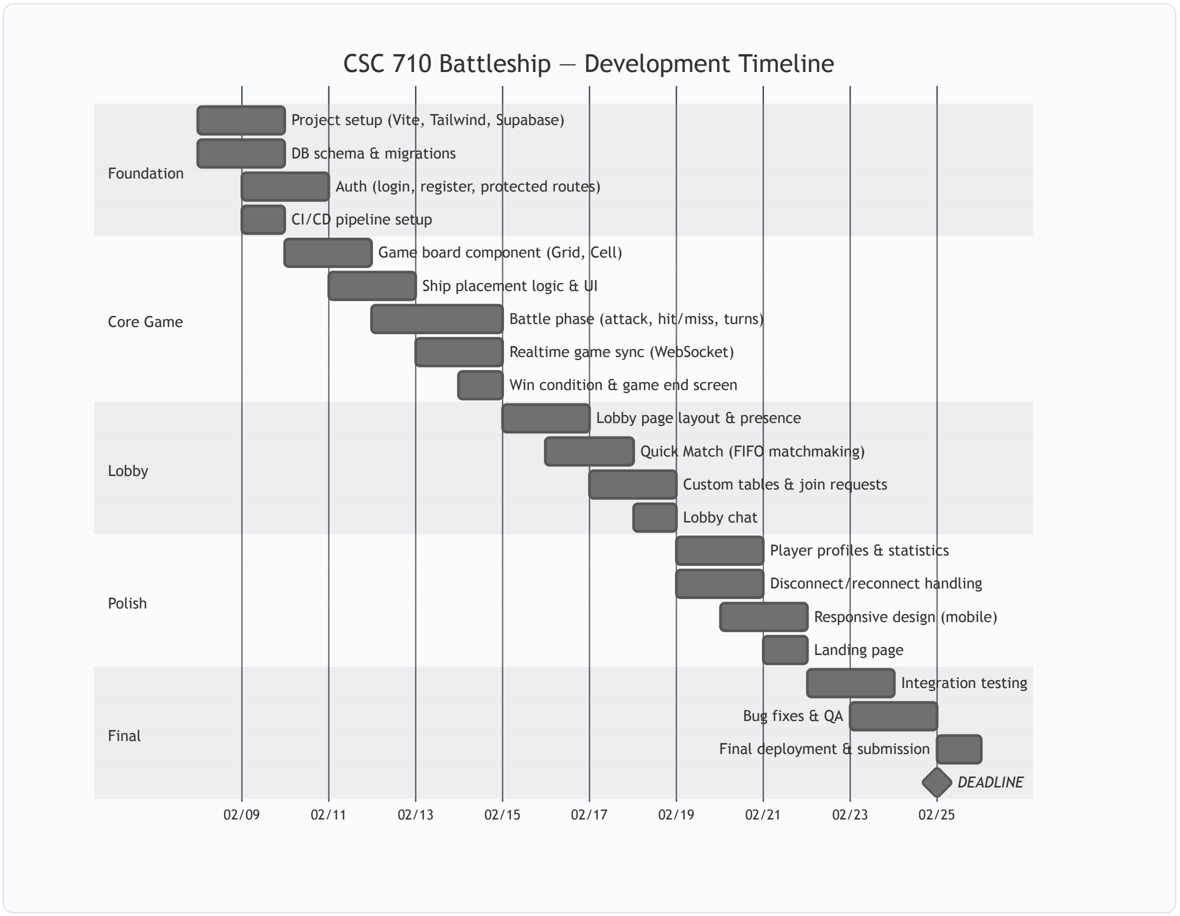
```
// Heartbeat implementation
const HEARTBEAT_INTERVAL = 10_000;  // 10 seconds
const DISCONNECT_THRESHOLD = 30_000; // 30 seconds stale = disconnected
const RECONNECT_TIMEOUT = 120_000;   // 2 minutes to reconnect

useEffect(() ⇒ {
  const interval = setInterval(async () ⇒ {
    await supabase
      .from('games_players')
      .update({ last_heartbeat: new Date().toISOString() })
      .eq('game_id', gameId)
      .eq('player_id', userId);
  }, HEARTBEAT_INTERVAL);

  return () ⇒ clearInterval(interval);
}, [gameId, userId]);
```

18. Project Timeline & Milestones

18.1 Sprint Plan (Feb 8 – Feb 25, 2025)



18.2 Milestone Checkpoints

Date	Milestone	Deliverable
Feb 10	M1: Foundation	Auth working, DB schema deployed, CI/CD green
Feb 15	M2: Playable Game	Two players can place ships and battle (via direct URL)
Feb 19	M3: Lobby Complete	Full lobby with matchmaking, tables, chat
Feb 22	M4: Feature Complete	Profiles, stats, disconnect handling, responsive
Feb 25	M5: Ship It 🚀	All bugs fixed, deployed, submitted

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19. Future Enhancements

These features are **out of scope** for the Feb 25 deadline but documented for potential future development:

Feature	Description	Complexity
Spectator Mode	Watch ongoing games live	Medium
ELO Rating	Skill-based matchmaking instead of FIFO	Medium
Sound Effects	Hit, miss, sunk, victory audio cues	Low
Animations	Explosion animations for hits, water splash for misses	Medium
OAuth Login	Google / GitHub social login	Low
Friend System	Add friends, invite to games	High
Leaderboard	Global ranking page	Medium
In-Game Chat	Text chat during battle	Low
Game Replay	Watch completed games move by move	Medium
AI Opponent	Single-player mode against computer	High
Custom Rules	Different grid sizes, ship counts	Medium
RLS Policies	Server-side security for board data	Medium
Edge Functions	Server-side move validation	Medium
Profanity Filter	Chat message filtering	Low

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Appendix A: Supabase Project Setup Checklist

- [ ] Create Supabase project
- [ ] Run SQL migration script (Section 6.3)
- [ ] Enable Realtime for tables: `games`, `games_players`, `moves`, `tables`, `table_requests`, `chat_messages`, `matchmaking_queue`
- [ ] Configure Auth: enable email/password provider
- [ ] Set email confirmation to disabled (for development speed)
- [ ] Copy project URL and anon key to `.env`
- [ ] Add secrets to GitHub repository settings

Appendix B: Local Development Setup

```
# Clone repository
git clone https://github.com/<org>/battleship.git
cd battleship

# Install dependencies
npm install

# Set up environment
cp .env.example .env
# Edit .env with your Supabase credentials

# Start development server
npm run dev
# → http://localhost:5173/battleship/

# Type checking
npx tsc --noEmit

# Linting
npx eslint src/ --ext .ts,.tsx

# Build for production
npm run build
```

Appendix C: Naming Conventions

Item	Convention	Example
React components	PascalCase	`GameBoard.tsx`
Hooks	camelCase with `use` prefix	`useMatchmaking.ts`
Types/Interfaces	PascalCase	`GamePlayer`
DB tables	snake_case	`games_players`
DB columns	snake_case	`display_name`
CSS classes	Tailwind utilities	`bg-blue-500 text-white`
Constants	UPPER_SNAKE_CASE	`HEARTBEAT_INTERVAL`
File names (non-component)	camelCase	`gameLogic.ts`
Branches	kebab-case	`feature/lobby-chat`
Commits	Conventional	`feat: add ship placement`

Document prepared for CSC 710 — Battleship Online Multiplayer Project Team: Umut, Merve, Justin Last updated: February 8, 2025