

# PROJECT Design Documentation

## Team Information

- Team name: Something-Cool
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## Executive Summary

This project allows players to play local checkers games using any common web-browser. Players can start playing by signing in using their name, and then initiate a game by selecting the name of other signed in players.

## Purpose

This project was created in order to allow people to have fun playing checkers, while also teaching some people how to play checkers.

## Glossary and Acronyms

Term	Definition
CheckersGame	Represents a game of checkers
Player	An object that represents the actions of a real life player
Board, BoardView	An object that represents a checkerboard
Row	A row of the BoardView object
Space	A Object that represents a location on the Row
Piece	A checker object that is moved by a Player
Move	A class that represents a move for a checker piece.

## Requirements

The project should allow a player to be able to start a game of checkers against an opponent. The game will keep track of the progress of a game and award a win condition to the player if either:

- The opponent has no pieces left, OR
- The opponent resigns.

## Definition of MVP

The player is able to sign in, play a game of checkers against an opponent, and then sign out of the web service .

## MVP Features

The MVP features:

- Sign in/out functionality
- Making a move
- “Jumping move” for pieces
- Resigning from a game

## Roadmap of Enhancements

A list of enhancements that will come to the project are :

- Spectator mode - View an ongoing game and be able to watch other people play.
- Replay mode - be able to watch replays of the past games that were played.

## Application Domain

This section describes the application domain.

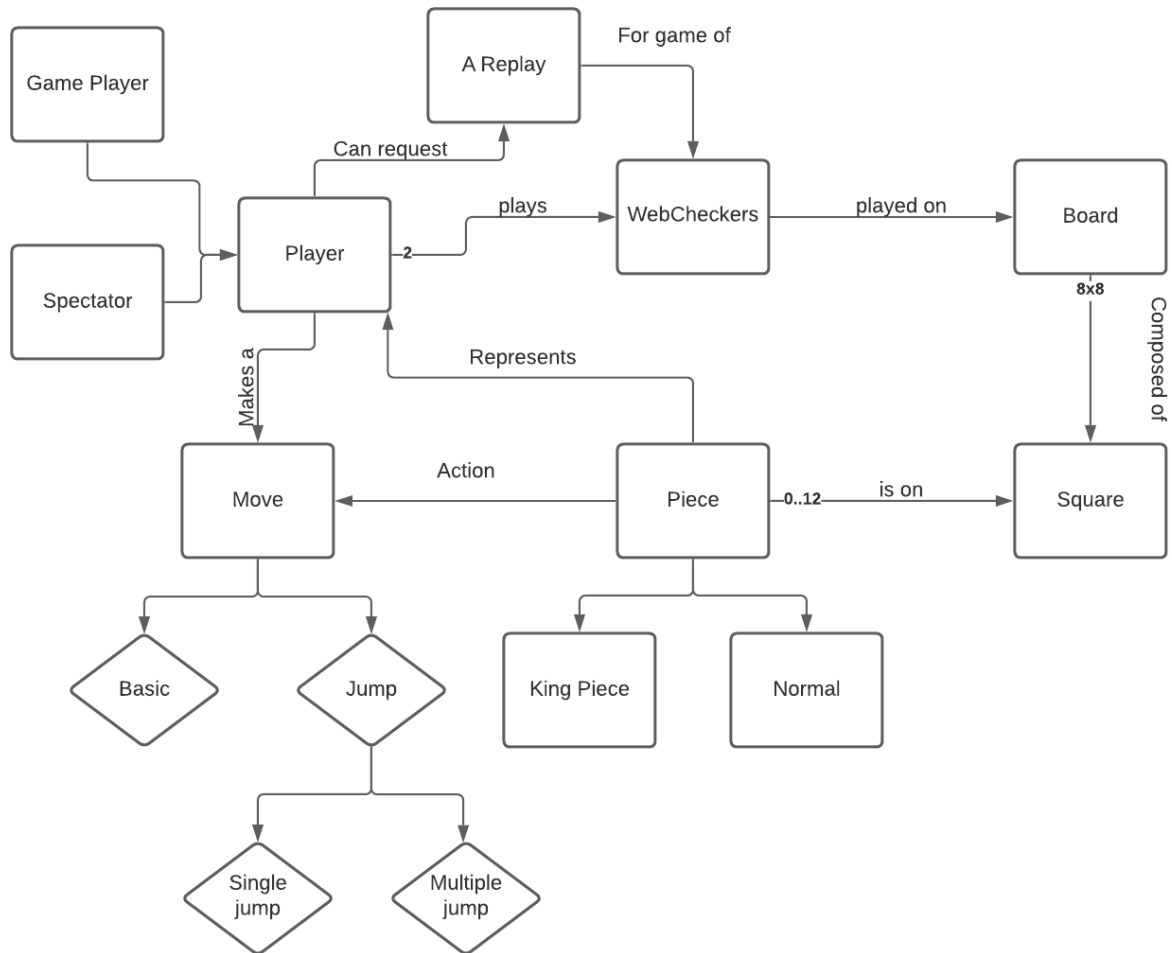


Figure 1: The WebCheckers Domain Model

- A signed-in Player is able to join a match with another signed-in Player who is not already in a game.
- The two players play a WebCheckers game on a Board until one Player wins and the other loses.
- Pieces on the Board can be moved by a Player when it is their turn. There are different types of moves a player can make, either to a valid space or in attempt to capture an opponent Piece.
- Pieces are deemed King Pieces when they reach the last Row of the opponent's side.
- Signed-in Players can spectate a match that two other signed-in Players are in.
- Players who have completed a WebCheckers match can request a replay for that given game.

## Architecture and Design

This section describes the application architecture.

### Summary

The following Tiers/Layers com.webcheckers.model shows a high-level view of the webapp's architecture.

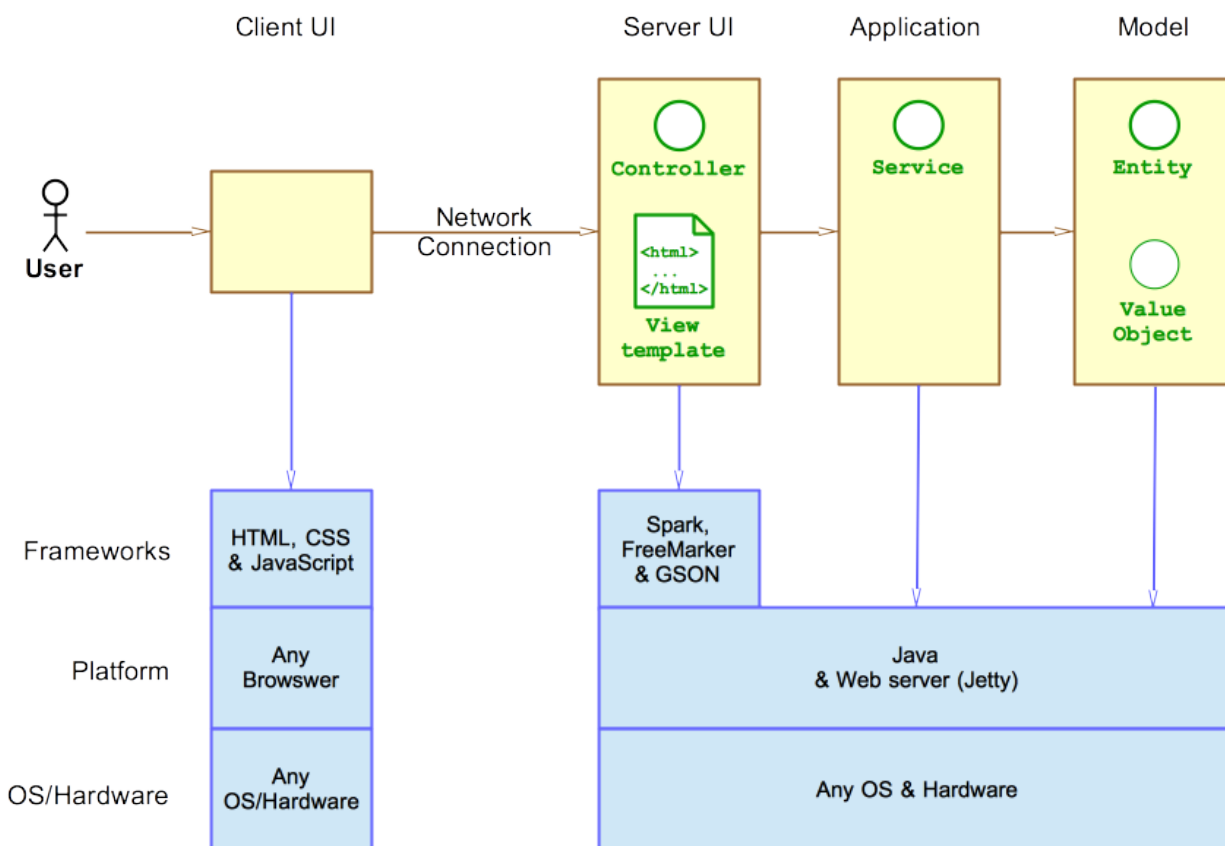


Figure 2: The Tiers & Layers of the Architecture

As a web application, the user interacts with the system using a browser. The client-side of the UI is composed of HTML pages with some minimal CSS for styling the page. There is also some JavaScript that has been provided to the team by the architect.

The server-side tiers include the UI Tier that is composed of UI Controllers and Views. Controllers are built using the Spark framework and View are built using the FreeMarker framework. The Application and Model tiers are built using plain-old Java objects (POJOs).

Details of the components within these tiers are supplied below.

### Overview of User Interface

This section describes the web interface flow; this is how the user views and interacts with the WebCheckers application.

Once a connection is established, the user is brought to the Home page where they can click a sign in button. To sign in, the user is brought to the Sign In page and, once signed in, brought back to the Home page. If a user enters a invalid name, they are brought back to the sign in page until a valid name is entered. From the Home page, the user can enter a game with another player, bringing them to the Game page. Finally,

when the game ends, the user is brought back to the Home page where they are still signed in, able to enter another game.

## UI Tier

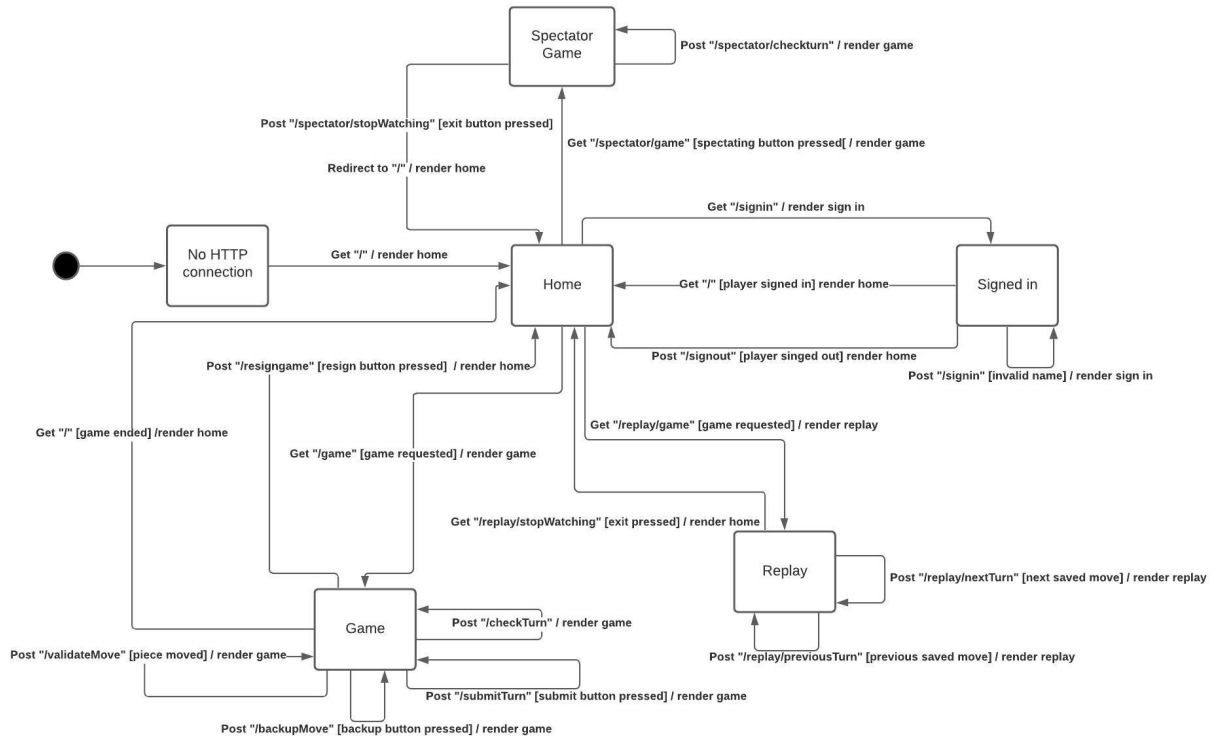


Figure 3: Full Interface

When the application starts, the application starts up the **WebServer**, connects to **GetHomeRoute**, and renders to the home page. The user can click on a “Sign In” button and **GetSignInRoute** will then take them to the login page where they can enter a username. If the name is invalid or taken, the **PostSignInRoute** will prompt the user to select another name. Otherwise the user will be brought back to the home menu, where they can now select a game.

Upon selecting a game (by clicking on a player in the lobby), the game calls **GetGameRoute** and starts a game with the other player. During the game, the program calls **PostCheckTurnRoute** to see whose turn it is. During a players turn, a player can move a piece, and it will call **PostValidateMoveRoute** in order to see if the move is valid. If so, the player can either submit the move (**PostSubmitTurnRoute**) or revert their move (**PostBackupMoveRoute**). After the move is submitted, the other player gets to take their turn.

The game ends in one of two ways.

- The game ends normally ( after a side has their pieces taken. )
- A player resigns (calls **PostResignGameRoute**)

In both cases, the player is brought back to the home menu. From there, the player can start another game, or log out (**PostSignOutRoute**). The player also has the ability to watch replays of past games.

When a player wants to watch a replay of a game, that player calls **GetReplayGameRoute** to start the replay. The player can get the next and previous moves using **PostNextTurnRoute** and **PostPreviousTurnRoute**. When a player wants to stop watching a replay, the program calls **GetSpectatorStopWatchingRoute** and brings them to the home page.

Lastly, A player can also spectate a game. When this occurs, the game calls `GetSpectatorGameRoute` and brings the player to an already active game. Upon each turn, `PostSpectatorCheckTurnRoute` is called, which update the view of the board. When the game ends, the game then calls `GetSpectatorStopWatchingRoute` that redirects the spectator to the homepage.

## Application Tier

There are three classes in the application: `PlayerLobby`, `GameManager`, and `GameController`.

- `PlayerLobby` manages the all the players currently signed in. It manages name validation and stores the names in a `TreeSet`.
- `GameManager` finds/creates a game checkers. It also handles player resignation.
- `GameController` creates a new game board with `Pieces` in preset locations

## Model Tier

Upon starting a new game, the Project creates a new `CheckersGame` to two `Player` entities. The `CheckersGame` creates a new board by creating a two dimensional array and filling it with the `Space` Object, then add the `Piece` Object to some of the spaces.

In between each `Player` turn, `CheckersGame` uses `BoardView` (which uses `Row`) to render the board to the web. The `Player` can the `Move` the `Piece` to another `Space` on a different `Position` to advance their turn. Each `Move` that is submitted then gets added to `SavedMove` Pieces can become Kings if they reach the other side of the board, which allows them to move in any direction. If all the opponents pieces are captured, or the opponent resigns, then the player is assigned the winner, and the opponent is assigned the loser. The game then becomes a `SavedGame`, which is available to select in the users replay mode.

## Design Improvements

A lot of the code is currently running in `CheckersGame`. One improvement to the code would be to split that class up into smaller classes so that it is easier to test and debug.

## Testing

### Acceptance Testing

Out of the 78 classes that are tested, all 78 of them pass the acceptance criteria test.

### Unit Testing and Code Coverage

The code testing strategy is to run a unit test for each class in the code. In each unit test, several functions were tested to ensure that they work. For example, the class `BoardView` would get `BoardViewTest`, and in `BoardViewTest`, a test was set on the iterator to make sure it did not return a Null value. These values were selected so that the program does not return an incorrect value, and most of the targets were met. The exceptions were the `WebServer` and a few lines in `CheckersGame`.