DraftRes

A ResilientDB - based Draft Fantasy Football System

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ECS 265: Distributed Database Systems
Fall 2023
Final Report

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1. ABSTRACT

The landscape of fantasy sports has evolved from a casual weekend pastime to a billion-dollar industry, attracting millions of participants annually. According to research conducted by the Statista Research Department [1], the number of fantasy sports players in North America has surged by 311%, reaching 47.3 million people since 2003. Notably, from 2015 onwards, there has been a significant increase of 5.7 million participants, marking a 10% rise. The influx of participants managing fantasy teams has not only led to a surge in engagement but has also been accompanied by a substantial influx of capital through sports betting. In 2017, online sports betting generated an estimated revenue of 590 million dollars. Fast forward to 2022, and this figure has skyrocketed to an impressive 7.24 billion dollars, signifying a remarkable 1,127% increase in revenue. This exponential growth is intricately linked to the expanding popularity and influence of fantasy sports within the market. Fantasy gaming enjoys widespread popularity, and while global statistics are challenging to ascertain, the Fantasy Sports & Gaming Association [2] approximates that 62.5 million individuals engaged in some form of fantasy sports game in the United States last year. The U.S. stands out as the world's most mature market for fantasy sports.

Participants in fantasy games assemble teams comprising athletes from different teams, combining them into diverse hypothetical line-ups. These teams compete against each other, and the fantasy team with the highest score emerges as the winner. The complexity of fantasy games can vary, ranging from those based on straightforward arithmetic using players' counting stats to more intricate ones incorporating analytics-driven concepts like value and efficiency.

The first stage in any fantasy game involves the creation of teams, a process that traditionally encompasses various methods such as auctions, snake drafts, and auction drafts. Within our project, we have innovatively implemented this initial team creation step, opting for the strategic and dynamic approach of a snake draft system. In the realm of fantasy sports, the snake draft system introduces an engaging and balanced method for participants to select players. Unlike traditional drafts, the snake draft operates in a serpentine fashion, providing each participant with an opportunity to make selections in a fair and equitable manner. The draft order reverses after each round, ensuring that every participant has a chance to acquire top-tier players while maintaining a sense of fairness and competitiveness. Our implementation of the snake draft system within the project aims not only to enhance the user experience but also to foster strategic thinking among participants. This dynamic drafting approach introduces an element of unpredictability, as each participant must consider their choices carefully, factoring in the preferences and strategies of other participants in the draft. By incorporating the snake draft system into the team creation process, our project aligns with the evolving preferences and expectations of fantasy sports enthusiasts. This innovative approach not only adds an element of excitement to the initial phase of the game but also sets our platform apart by embracing a method that combines strategy, fairness, and user engagement.

2. INTRODUCTION

In the dynamic world of fantasy sports, DraftRes emerges as a cutting-edge application designed to deliver the Premier League fantasy football experience. Merging the thrill of sports with the robustness of distributed database systems, this project introduces an innovative approach to fantasy football drafting. At the heart of DraftRes lies the integration of ResilientDB, a decentralized database system, which forms the backbone of our application. This strategic incorporation not only elevates the trust and security aspects of the fantasy drafting process but also ensures fairness and transparency, key attributes sought by fantasy sports enthusiasts. As a pioneering venture in the realm of fantasy sports, DraftRes aims to:

i. Enhance Trust and Security: Leveraging the decentralized nature of ResilientDB to provide a fair and unbiased drafting environment, free from the influence of any single entity. Security is ensured through ResVault using the owner's wallet key, that is how the transactions (drafts) are carried out. If the wallet key does not match, the players won't be drafted. Secure access refers to joining through the league IDs that have already been created or creating a league ID.

ii. ***Create a Futuristic Draft Room Experience:*** Introducing an innovative draft room interface with secure access and a balanced drafting sequence, enriching the overall user experience.

iii. Ensure Real-time Transparency: Offering live updates (getting to see what your team looks like so far) during drafts and maintaining a clear record of players selected so far by each team to make sure there is no overlap and that a particular player can be drafted by only one team in the league.

3. PROBLEM STATEMENT

Fantasy football, a popular pastime for sports enthusiasts worldwide, involves participants drafting imaginary teams from a pool of real players and competing based on their statistical performances in actual games. While engaging, this realm faces several challenges that hinder the overall user experience and the integrity of the game.

i. Lack of Transparency and Fair Play: Traditional fantasy football platforms often lack sufficient mechanisms to ensure fairness and transparency. This can lead to disputes over player drafts and scoring.

ii. Data Management and Integrity Issues: Maintaining the integrity and accuracy of player data is crucial for a fair competition. However, many platforms struggle with real-time data updates and secure data management, impacting the reliability of the game.

iii. Limited User Engagement and Interaction: A significant aspect of fantasy football is the community experience. Yet, many platforms offer limited opportunities for user interaction and engagement, diminishing the social aspect of the game.

iv. Technological Limitations: Current fantasy football platforms often fail to leverage advanced technologies effectively, leading to a lack of innovative features, poor user interfaces, and inadequate support for large-scale user participation.

Our DraftRes project aims to address these challenges by developing a technologically advanced, user-friendly, and transparent platform for fantasy football. By incorporating sophisticated database systems and focusing on user experience, DraftRes is designed to revolutionize how fantasy football is played and enjoyed. The goal is to create a platform that not only enhances the gameplay experience but also fosters a sense of community and fairness among its users. With ResilientDB's decentralized architecture, DraftRes ensures a level playing field, preventing any single entity from exerting control and promoting fault tolerance for a seamless drafting process. The futuristic Draft Room experience introduces secure access through valid credentials and adopts a dynamic "snake" sequence in the draft order, ensuring balance and strategic depth. Real-time transparency becomes a hallmark as the system provides instant updates on player selections, guaranteeing database integrity through ResilientDB's decentralized nature.

4. MARKET RESEARCH

We surveyed the market and found out more about the fantasy sports market.

i. Fantasy Sports Platforms:

Fantasy sports have evolved from niche hobbies to global phenomena, captivating millions of enthusiasts. Some studies [3] shed light on the growing significance of fantasy sports within the broader sports industry. These studies highlight the socio-cultural impact of fantasy sports, diving into the motivations, demographics, and behavioral patterns of participants

ii. Challenges in Fantasy Sports:

As highlighted by previous research [4], traditional fantasy sports platforms face challenges related to transparency, fairness, and user engagement. Disputes over player drafts, scoring inconsistencies, and limited community interaction have been recurrent issues. Addressing these challenges is crucial for enhancing the overall user experience and sustaining the growth of the fantasy sports industry.

iii. Database Technologies in Fantasy Sports:

Distributed database systems play a pivotal role in addressing challenges related to data management and integrity in fantasy sports platforms. One of the studies [5] discusses the potential of decentralized databases in ensuring real-time updates and secure data storage for fantasy sports applications. This aligns with the core objective of DraftRes to leverage ResilientDB for a fair and transparent drafting process.

iv. User Experience in Fantasy Sports Applications:

User experience (UX) is a critical factor in the success of fantasy sports platforms. Studies [6] have explored the impact of interface design, interactivity, and real-time updates on user satisfaction and engagement. DraftRes aims to contribute to this body of knowledge by introducing a futuristic draft room experience, prioritizing secure access, and dynamic drafting sequences to enrich user interaction.

v. Integration of Blockchain and Distributed Ledger Technology:

The integration of distributed ledger technologies, such as blockchain, in fantasy sports platforms has been a subject of interest [7]. These technologies offer enhanced security, transparency, and traceability. DraftRes stands at the forefront of this trend, integrating ResilientDB to ensure the integrity of the drafting process and redefine industry standards.

vi. Emergence of Decentralized Platforms:

The rise of decentralized platforms in various industries has spurred interest in their application to fantasy sports. A study [8] was conducted to discuss the benefits and challenges of decentralized systems. DraftRes aligns with this trend, leveraging ResilientDB's decentralized architecture to create a level playing field in fantasy football drafting.

Our market research emphasizes the growing significance of fantasy sports, highlights challenges faced by traditional platforms, explores relevant database technologies, explores user experience considerations, and discusses emerging trends in decentralized systems. DraftRes, with its innovative integration of ResilientDB, seeks to address these issues and contribute to the evolving landscape of fantasy sports applications.

5. DATASET

We have explored many different datasets on Kaggle and finally chose one which contains all the details about players from the 2022-2023 season of the English Premier League. This includes various fields, such as the name of the player, a unique ID associated with each player, the age of the player, and the URL of the player's photo. It also provides general information such as nationality, club, and the position the player plays in. Finally, it includes some statistics about the player, including an overall rating, the potential rating of the player, information about the preferred foot of the player (indicating whether they are more likely to shoot with the left or right foot), a weak foot rating, and a skill moves rating (indicating the likelihood of the player doing skill moves in-game). All this information is in the form of a CSV file and is uploaded using a Python script and transactions to ResilientDB. The Python script creates mutation functions for each player, which are then used to store the information about each player in the form of a transaction on ResilientDB. There are a total of 195 players in the dataset, and 195 different transactions are performed to store each player's details. Currently, users can choose players and create teams only from the available players. In the future, we plan to add more datasets and give users the option to upload their own datasets too.

6. SOLUTION

In our application, users have two primary options: creating a league or joining an existing one. When creating a league, the host user can personalize it by entering a league name, team name, and the number of users allowed in the draft room. The communication is facilitated through the ResVault wallet, interacting with the GraphQL server to generate a unique room key known as the leagueID. This leagueID

is formed by concatenating two keys - *recipientPublicKey* (common to all transactions that take place for that league) and an *ownerPublicKey* (which is the wallet key displayed in the ResVault extension) of the player that creates the league room (also known as the host). This leagueID serves as an identifier that users can share with others to join the league. Joining a league involves entering this room key and selecting a team name. The draft room activates when the specified number of teams is reached.

Our drafting process employs a snake draft approach, ensuring a fair and balanced selection order. For example, if teams are labeled A, B, C, and D, the drafting sequence follows the serpentine pattern: A-B-C-D-D-C-B-A-A-B-C-D-D-C-B-A. The drafting order reverses after each round, maintaining equity among users. The screen displays crucial information about the teams in a round-by-round format at the top.

An initial template of 12 rounds is pre-configured with slots matching the number of participating teams. As users join, their team names populate these slots in the snake draft format, ensuring a dynamic drafting experience. Details of all the players, including name, club, nationality, weak foot, photo, age, overall rating, potential, preferred foot, and position, are conveniently listed below the round information. Each player entry features a draft button for users to select players for their teams. We've populated this section with a comprehensive dataset comprising player details from the 2022-2023 English Premier League season. Leveraging a Python script, we efficiently stored player data in ResilientDB, executing separate transactions for each player. This meticulous approach ensures a seamless and data-rich drafting experience for our users.

When a user drafts a player or chooses a player for their team, it deactivates the draft button of that player for every other user, which means they cannot add that player to that team. This ensures one player is only picked by one team in the draft. There is also a search option where users can directly find the player they want to add to their team. This process happens for each user in each round until all the users have filled their teams with 12 players. Once that is done, the draft ends and the user can view the whole roster.

Every draft is a transaction into the database. Each transaction is signed by each player’s ResVault public key (also known as owner key) and the recipient public key (common for everyone in the league room).

These are the transactions that we used in the system:

i. Filter:

```
sdk.sendMessage({
    direction: "filter-page-script",
    owner: ownerPublicKey,
    recipient: recipientPublicKey,
  });
```

This query is used for retrieving the data based on the owner and recipient's public key. It returns all those transactions made by the owner (identified by the 'owner public key' value) using the 'recipient public key'.

ii. Commit:

```
sdk.sendMessage({
    direction: "commit-page-script",
    message: data,
    amount: 100,
    address: recipientPublicKey
  });
```

This is used to send data from the frontend to ResilientDB. Here, the address is the recipientPublicKey which is used to sign the transaction and send it to the database. We have sent a constant amount of '100' for each commit transaction and the data field contains values depending on what is being inserted into the database. For example, while creating a league we send the league name, team name, number of league members, uniquely created league ID, and a timestamp as the asset.

iii. Fetch:

```
sdk.sendMessage({
    direction: "get-page-script",
    id: transaction_id.
  });
```

Each transaction is unique and has a transaction ID attached to it. The Fetch query retrieves the transaction using this transaction ID.

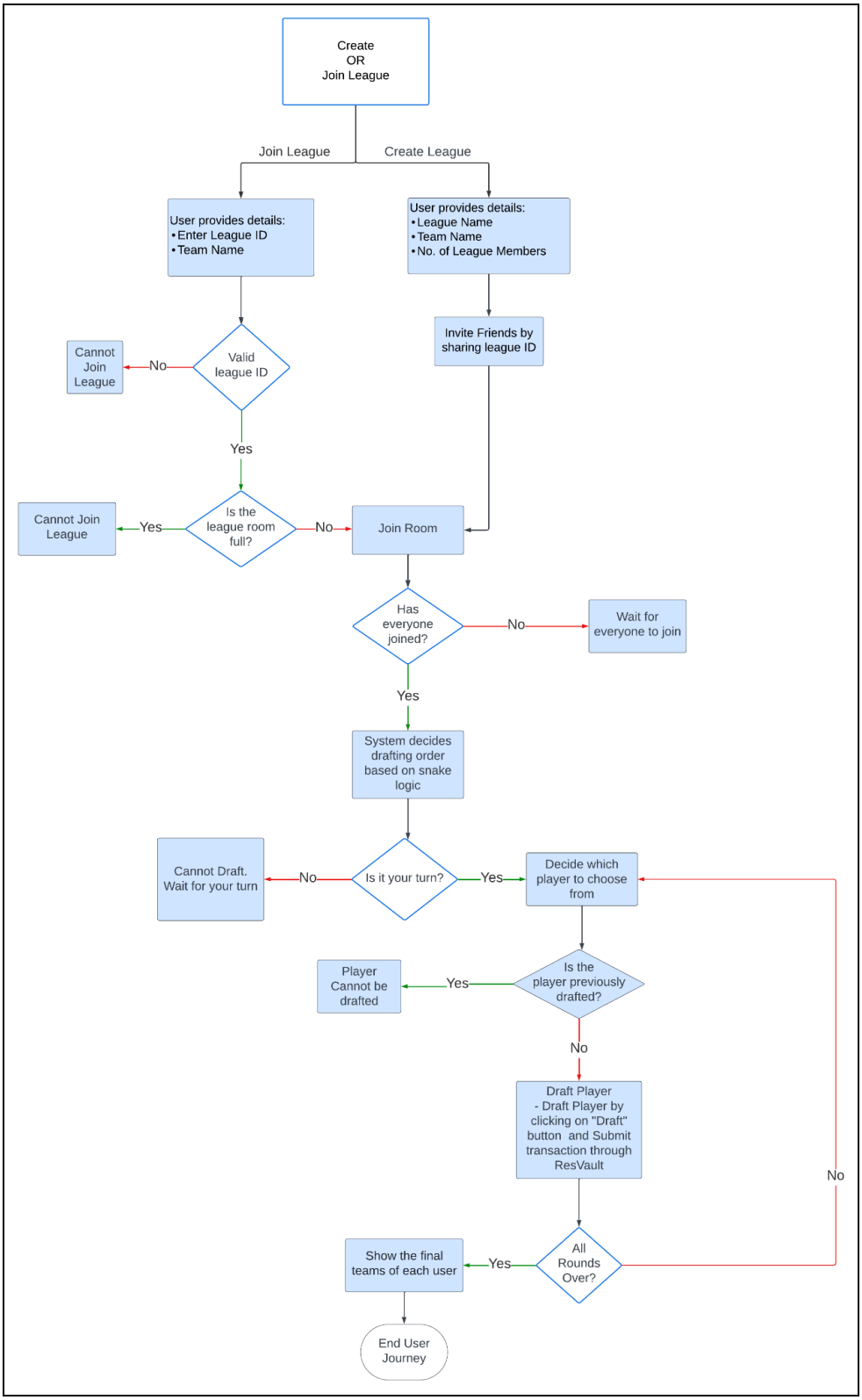

Fig. 1. *A flowchart of the system*

7. TECHNOLOGY USED & SYSTEM ARCHITECTURE

DraftRes, introduces a decentralized platform for sports player drafts, specifically designed for fantasy sports scenarios. Fueled by our passion for innovative solutions, DraftRes incorporates ResilientDB as the cornerstone - a decentralized database - and the ResilientSDK, our go-to Software Development Kit. This dynamic duo ensures secure and transparent communication within our application components, creating an environment that's both resilient and tamper-proof.

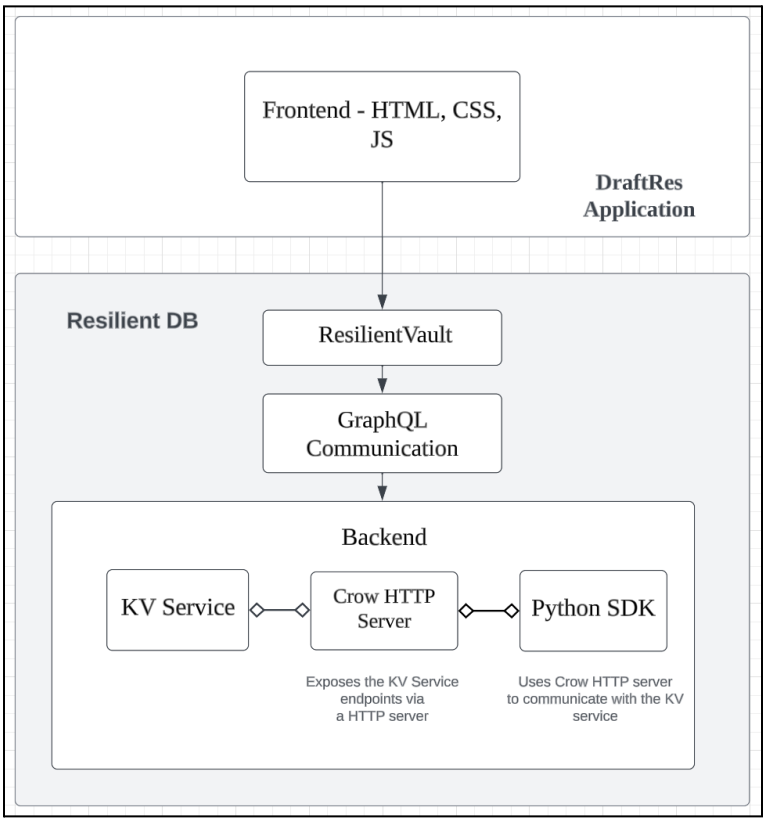

Fig. 2. *System Architecture*

Frontend (HTML, CSS, JS): The front end of the Draft Res application is built using HTML, CSS, and JavaScript. HTML is used for structuring the web pages, CSS for styling and layout, and JavaScript for dynamic behavior and interactivity. The user interacts with the application through the frontend, which communicates with the backend to fetch and display data.

Resilient DB Connection with Resilient Vault: Resilient Vault is employed for secure storage of sensitive information, such as credentials and other secrets. The frontend communicates with the Resilient DB through the backend, ensuring that data transactions are secure and encrypted.

GraphQL Communication: GraphQL is used for efficient and flexible communication between the front end and the back end. It allows the front end to request only the data it needs, reducing over-fetching and under-fetching of information. The GraphQL queries are processed on the server side, enabling the front end to receive precisely the data it requested.

Backend Components:

- KV Service: The backend includes a Key-Value (KV) service, responsible for storing and retrieving data in a simple key-value format. The KV service is essential for managing data in a way that is easy to access and manipulate.
- Crow HTTP Server: A Crow HTTP server is employed to expose endpoints for interacting with the KV service. Crow is a C++ micro-framework for web applications, providing a lightweight and efficient HTTP server. The server handles incoming HTTP requests, processes them, and communicates with the KV service to perform the necessary operations.
- Python SDK: The Python SDK (Software Development Kit) is utilized to facilitate communication between the front end and the back end. It interacts with the Crow HTTP server to send requests to the KV service and receive the corresponding responses. The SDK abstracts the complexity of the backend implementation, providing a convenient interface for the frontend to interact with the Resilient DB

The innovation represented by the DraftRes project has reached an advanced stage of technical development. This includes a functional platform, solid SDK integration, the use of GraphQL for efficient communication and the implementation of a user interface. These elements collectively showcase a holistic and mature approach to decentralized sports drafting. The existing codebase serves as a testament to the project's advancement, translating conceptual ideas into a tangible, functional platform seamlessly.

8. APP DESIGN

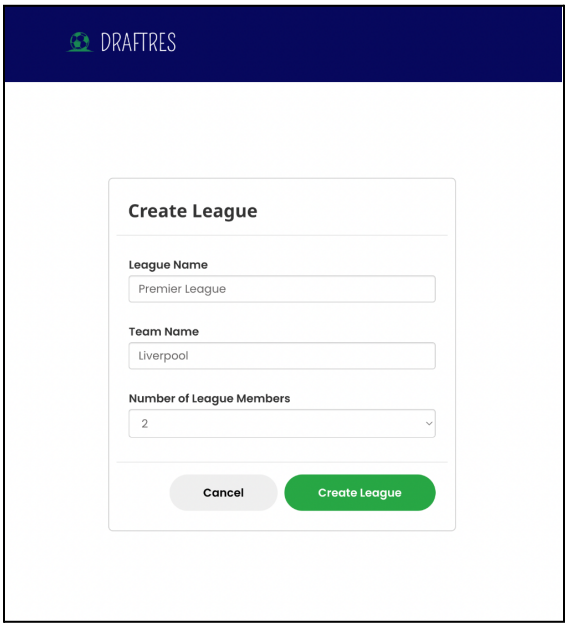

Fig. 3. *Create League Page*

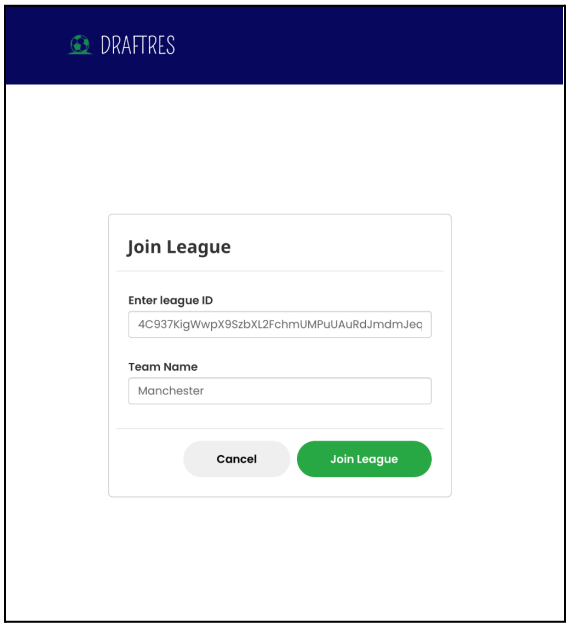

Fig. 4. *Join League Page*

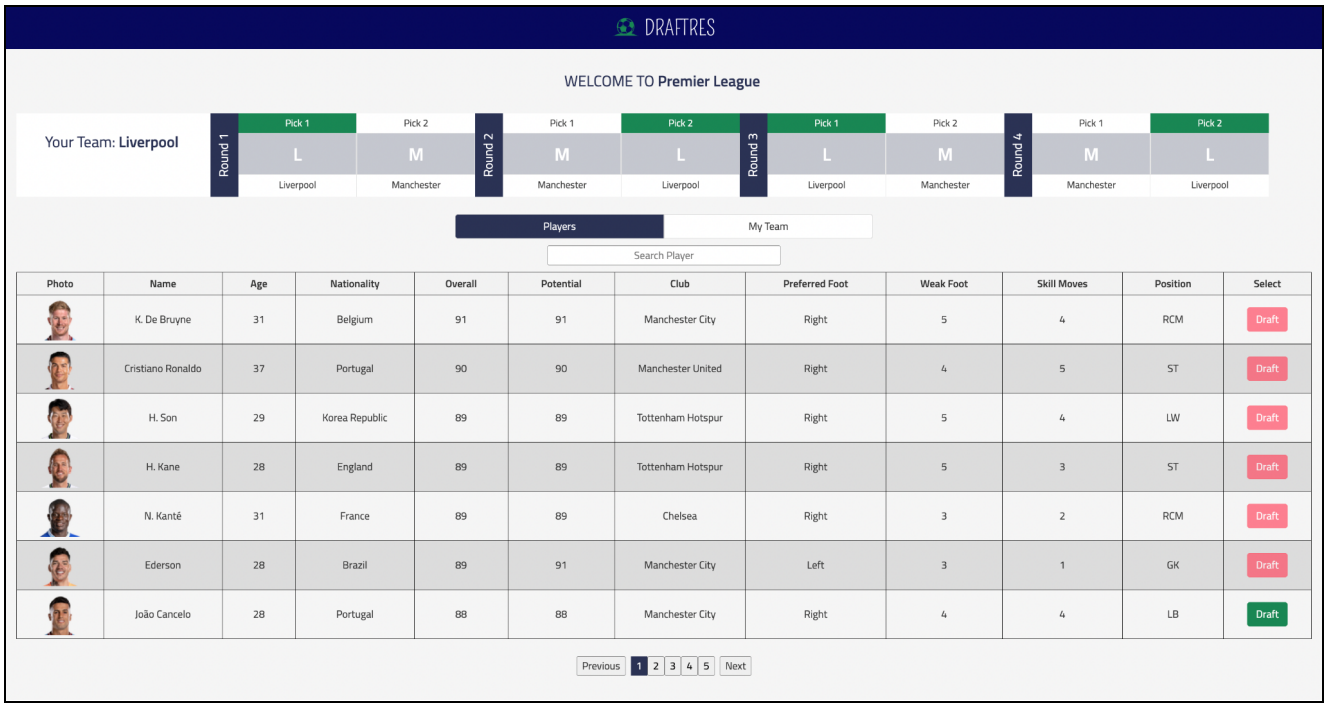

Fig. 5. *League Room*

9. FUTURE WORK

While our current project serves as an excellent foundation for the initial phase of fantasy sports games, there's substantial room for enhancement. Given additional time, we envision transforming this platform into a comprehensive decentralized fantasy sports application. This expansion includes implementing live weekly updates, a transparent point system allowing players to track their progress each matchday, and a final comparison to determine the ultimate winner. Another avenue is adding machine learning to our project. By incorporating machine learning algorithms, we can transform the user experience by offering personalized player and match predictions. This predictive analytics feature enhances the platform's dynamism, offering users a competitive edge and an unparalleled level of engagement.

Currently, our platform utilizes the draft method for player selection, but we aim to diversify by incorporating additional methods such as auctions and draft auctions for team building at the start of each season. To enrich the user experience, we propose introducing features like a draft chat, enabling users to communicate during the drafting process. Furthermore, we plan to implement timers for each round, adding an element of excitement with countdowns, and an auto-pick functionality, streamlining the process by automatically selecting a player when it's the user's turn. These enhancements are geared towards making the platform more interactive, engaging, and user-friendly, elevating the overall fantasy sports experience for our users.

While our current platform exclusively features player data from the English Premier League 2022-2023 season for team creation, our future plans involve expanding user options. We envision giving users the flexibility to choose their preferred dataset when creating a league. This strategic enhancement not only broadens the scope of our project beyond fantasy sports but also transforms it into a versatile

team-building platform. This newfound functionality opens up possibilities for application in diverse settings, including schools, offices, parties, and various other contexts. Users will have the autonomy to customize their team-building experience by selecting datasets that align with their interests, creating a more personalized and adaptable platform. This expansion aligns with our vision to provide a dynamic and inclusive team-building experience tailored to the unique preferences and objectives of our users.

10. CONCLUSION

In conclusion, DraftRes represents an innovative step forward in the world of fantasy sports, introducing a secure and equitable drafting experience through the integration of ResilientDB. The project effectively addresses key challenges seen in traditional fantasy sports platforms, prioritizing transparency and user engagement. The Draft Room's design enhances the overall user experience, setting new standards for fairness. Positioned in the evolving landscape of fantasy sports, DraftRes aligns with the market's growth, catering to the increasing number of participants and revenue generation. The technological foundation, including ResilientDB, ResilientSDK, and GraphQL underscores the platform's reliability. Future developments, such as machine learning integration and diverse drafting methods, show a commitment to ongoing improvement. DraftRes aims not only to enhance the enjoyment of fantasy sports but also to evolve into a versatile team-building platform for various contexts. As the project advances, it strives to leave a lasting impact on the convergence of sports, technology, and community engagement.

11. REFERENCES

[1] Online Article. *Fantasy sports players in North America*
https://www.statista.com/statistics/1377925/fantasy-sports-players-north-america/

[2] Online Article. *Fantasy Sports & Gaming Association (FSGA)*
https://thefsga.org/industry-demographics/

[3] Book on *Fantasy sports and the changing sports media industry: media, players, and society*.
https://docplayer.net/203067373-Fantasy-sports-and-the-changing-sports-media-industry.html

[4] Medium Article. *From Idea to Reality: Navigating Challenges in Fantasy Sports App Development*
https://alenamage.medium.com/from-idea-to-reality-navigating-challenges-in-fantasy-sports-app-development-d87e975dc8e9

[5] Medium Article. *LeagueDAO White Paper.*
https://medium.com/leaguedao/leaguedao-white-paper-a3dbf82050f7

[6] Medium Article. *Strategies to Attract New Users to Your Fantasy Sports App.*
https://medium.com/@betfoc/strategies-to-attract-new-users-to-your-fantasy-sports-app-85360619cbc9

[7] NewsBTC Article. *How Blockchain Technology Brings Innovation to Fantasy Sports.*
https://www.newsbtc.com/press-releases/how-blockchain-technology-brings-innovation-to-fantasy-sports/

[8] Shardeum Article. *Advantages and Disadvantages of Decentralization.*
https://shardeum.org/blog/advantages-and-disadvantages-of-decentralization/