

**Poké Planner: A Web-Based Pokémon Team Builder**

**A Technical Report  
presented to the faculty of the  
School of Engineering and Applied Science  
University of Virginia**

**by**

**Eddy Phan**

**with**

**Darwin Khay  
Darnell Khay  
Vivine Zheng**

**May 11, 2023**

**On my honor as a University student, I have neither given nor received unauthorized aid  
on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.**

**Eddy Phan**

**Technical advisor: Briana Morrison, Department of Computer Science**

# Poké Planner: A Web-Based Pokémon Team Builder

CS4991 Capstone Report, 2022

Eddy Phan

Computer Science

The University of Virginia

School of Engineering and Applied Science

Charlottesville, Virginia USA

[eqp6wkt@virginia.edu](mailto:eqp6wkt@virginia.edu)

## ABSTRACT

In a Pokémon game, players building an effective team is essential as they travel and explore different regions within the game. To simplify the team-building effort, I designed a new web-based team builder service based on the statistical analysis of all the Pokémon in the Pokédex from seven generations. Through this application, players are able to analyze individual Pokémon, their statistics, as well as other relevant information about them. To develop this project I used technologies, such as PHP, HTML, phpMyAdmin, deployed using UVA's CS 4640 server. Results showed individual Pokémon data through the Pokedex page for analysis and observations, enabling users to create teams from that data. Future work on the Poké Planner will include allowing for future Pokémon data to be added and improving the user interface to create better clarity and user experience.

## 1. INTRODUCTION

The competitive Pokémon scene is different casual battles players encounter in the game's story. Players go against others who understand the battle mechanics and will use that to their advantage. A balanced team makes it easier for players to defeat opponents and allows players to combat top players around the world. The world of Pokémon consists of a variety of different creatures, so it is important for players to develop unique and effective teams to be able to handle opponents they encounter in their journey. Just like in sports, it is important for players and coaches to optimize a cohesive team as a key component in winning. In the Pokémon world, a team that contains a high-performance and balanced composition will often

be more successful when competing in battles. Team building in Pokémon is the method that ties together a group of Pokémon that boast great synergy together. As each Pokémon has different attributes and abilities that make each one unique, it is essential that they cover the weaknesses of other Pokémon in the team, while providing support defensively or offensively in battles.

## 2. REVIEW OF RESEARCH

Many aspects of society, such as sports and business management, incorporate and emphasize the importance of team building. In a business, team building can be one of the most critical investments that lead to success of a product or project. Scudamore (2016) examined the importance of team building in business. He outlined that being in a team where one is comfortable is necessary since it builds trust, reduces conflict, increases productivity, and encourages communication. An ideal company will often have solid team building and employees will be more engaged as a result. This is great for company culture as employees are brought together to motivate one another and work collaboratively, which strengthens employees' morale and work productivity. Because these same benefits can apply to Pokémon teams, I took these ideas into consideration as I designed how Pokémon teams show synergy. Additionally, Mojica (2019) highlights that Having a strong team foundation can make working together on a project easier as it gives employees the opportunity to comfortably talk to each other and address any concerns they may have to work through a problem. However, some businesses focus more on contributing to consumer satisfaction and neglect the needs and values of their employees. As employees are

what make up a successful business, it is important that companies make sure their employees can work together comfortably and effectively. These ideas were considered as I outlined what was important in a Pokémon team since every Pokémon has a unique role.

Mull-Brooks (2019) examined the importance of teambuilding in sports. In some sports, such as Volleyball or Basketball, creating a team that encourages a healthy, positive environment, making sure that every player feels included, will benefit every player in the team. It promotes teamwork and the desire for each player to engage in the sport. Players become motivated to perform better and success is often displayed through the compatibility and trust of the players. Tran (2019) highlights that a game cannot be won by a single player without the support of other teammates. It is never a battle alone. Teams thrive through building trust and inspiring each other, which can unlock the full potential of the team's skill. One player's weakness is another player's strength. It is these characteristics that categorize and separates a winning team from the rest.

In Pokemon, team building is fundamentally no different. From the reasons above that make team building important, it is also necessary in Pokémon to create a team composition that consists of Pokémon that assist each other. A team of all defensive attributes, for example, will often not see success compared to a team that is balanced around synergy. The Poké Planner team builder application allows for users to check and analyze the weaknesses and resistances of your teams to determine if there are holes in your team's coverage.

### 3. PROPOSED DESIGN

In Poké Planner, creating a team will display how compatible the team is and convey if the team is in need of other Pokémon types, which will determine how balanced a potential team composition is. Unique Pokémon data and attributes were retrieved from a dataset using phpMyAdmin. PHP serves as the frontend framework and backend server, and phpMyAdmin for the database, which was all deployed using UVA's CS 4640 server.

#### 3.1 System Flow

When a user wants to create a new Pokémon team, they will first be identified as different types of users, those who are authenticated and those that are not.

Users who are not authenticated are only allowed to access the login or registration page of the website. Once authenticated, they should have privileges to the entire site, where they are allowed to create and modify teams, and view teams and Pokémon information. For developers and admin, there is a user.php page to view a table of all users (to insert, update, delete them as well). This is only accessible to developers, who can add sql queries to look for specific credentials. If the credentials match then they can set a cookie which gives the user access to see the navigation item to go to the user.php page.

#### 3.2 Implementation

The following sections outline the implementation details for Poké Planner. An explanation on how phpMyAdmin is used in Poké Planner is described in *Data Manipulation and Queries*.

3.2.1 *Data Manipulation and Queries*. To send data from the database server to the web client, queries were created. An example of a query that was used is shown in Figure 1 below:

---

```
number_of_pokemon INT CHECK
(number_of_pokemon <= 6)
```

---

Figure 1. Team Capacity Constraint Query

This query checks the number of Pokémon as an int and will make sure that a team will only consist of at most six Pokémon. This is used in case a user attempts to add an additional Pokémon to the team when the max number of allowed Pokémon is only six. Since it is a constraint on the table, it is automatically checked at every insert, so when the front end user tries to add a Pokémon, an error is triggered and the Pokémon is not added.

3.2.2 *Registration*. Registration requires the user to input a username and password. There is a security process

that is used to restrict access to member-only components until the cookies are set. Otherwise, the user would not be able to access any components of the website except the login/registration page. Users are able to create a new account by filling out a form where it will hold all the user data and import them into the database. We have used PHP's inbuilt `password_hash()` function to create a password hash from the password string that is entered by the user. It produces a password hash using a reliable hashing algorithm. It further applies a random salt when hashing passwords so if multiple users have the same passwords, their hashes would not be the same. We used password hashing because we wanted to avoid storing user passwords in plaintext in the database, which can cause security concerns. When a new user is registered, their email address, name, and password are all inserted into the user table.

**3.2.3 Login and Logout Process.** Login requires the user to input their username and password. Returning users are able to input their email and password in a login form. When the user attempts to login, the web application would verify the given password hash that is in the database using PHP `password_verify()` function as it would verify with the credentials stored in the database. If the information matches, the user is authorized and given access to the web-site, otherwise an error message would occur and their login attempt would be rejected.

**3.2.4 Teams.** When a user creates a new team, data is retrieved from a dataset using phpMyAdmin queries. These queries get a Pokémon object for each Pokémon selected through the team building process, which includes the attributes, type, and contents of each Pokémon. Once the user selects the desired Pokémon for their team, the data is retrieved from the database and displayed on the frontend and on the screen. Effectiveness of the teams is found by calculating the number of Pokémon in the team that is resistant against a certain Pokémon type. If the effectiveness against bug type, for example, is greater than 1, it means that the team contains more than 1 Pokémon that is effective against that type. A table will be displayed on the screen

that shows all the types and how effective the user's created team composition is against other Pokémon types. Users are able to modify and delete teams through queries, as well. To modify the team, the system grabs the newly specified Pokémon data from the database and replaces it with the old Pokémon in the team and updates the values of the team's effectiveness. Technical challenges for implementing the teams involved adding the right Pokémon data to the team that enabled loading teams more efficiently.

**3.2.5 Pokedex.** The Pokedex is the main way for a user to interact with the entire list of Pokemon from seven generations. The entire list of Pokémon from the first seven generations are obtained using database queries. These queries get the Pokémon objects and display the entire list through the frontend server. There are several filters users can use to sort the list of Pokémon. Queries are used for these filters to select the specified Pokémon and display it on the screen.

## 4. RESULTS

Poké Planner was successfully implemented using the described tech stack. Anyone that is new to Poké Planner can register for an account, which will be stored in the database.

### 4.1 Deployment

In order for this project to be available for users, Poké Planner was deployed using UVA's CS 4640 server to serve our frontend and backend. We deployed our application by using SecureFX where a user would need to login with the proper credentials to access CS 4640's server that will allow the user to access the file system (using SFTP) and MariaDB (using phpMyAdmin). Using UVA-provided SFTP Client, we can upload files to the server with an SFTP client, which is a common requirement of most web-hosting platforms. With [SecureFX](#) software, we can connect to an SFTP client and get connected to the server. Once the user is logged in, they will need to import their project's directory under their computing ID's folder in a folder called

public\_html, which will allow the application to be displayed on the web publicly.

#### 4.2 User Interface

The primary user interface aspects include the login and registration page, team creation page, Pokédex page, and the users page (for admin and developers). The login and registration page allows users to register for an account by creating a unique username and password. Once created, they can re-enter this information to login and view the entire site. The team creation page displays user's created teams and allows them to edit, and delete teams to fit their desires. Users have the option of creating a new team, which creates an empty pop-up to specify the team name and dropdowns to select their desired Pokémon to join the team. The Pokédex component displays every Pokémon from the first seven generations. Users are able to analyze attributes and statistics of these Pokémon. Since the Pokédex dataset is large, users are able to sort the list by various contents to find a specific Pokémon. The users page (for admin and developers), displays the entire list of registered users. Administrators and developers can modify/delete these users in concern for security issues. All components were built using the open source PHP framework to ensure consistency in design.

#### 5. CONCLUSION

In this paper, the design and implementation for the Poké Planner, a web-based Pokémon team builder service, was outlined. We verified that the basic functionalities for the team building process operated correctly. The general team building functionalities of the Poké Planner were verified by having users sign up for an account and create different teams with various attributes. The completion of this project displays how a web-based Pokémon team builder service can be successfully designed and implemented, which would allow players to create optimal Pokémon teams.

#### 6. FUTURE WORK

Future work on the Poké Planner will include future Pokémon data to be considered as new generations are continually being added. Currently the Poké Planner

only includes data from the first seven generations of Pokémon. However, new Pokémon are constantly being added to the franchise. Future work would be to adjust the Poké Planner to compensate for these new Pokémon being added, while keeping the foundation of the team building functionalities optimal. Players should not feel that their teams are incomplete by not having certain Pokémon included in the application.

Improvement can also be made to the user interface. Currently, new teams that are created take up a lot of screen space from all the information that is displayed about each team. Teams are stacked upon each other in a list format. Users who create numerous teams would see that all the information about each unique team is too cluttered. During testing, feedback was received which indicated a preference to condense the data displayed for better clarity. Future work will include interactive features that allow users to select a certain team and see the information associated with it.

#### 7. ACKNOWLEDGMENTS

Thank you to my team members, Darwin Khay, Darnell Kkay and Vivine Zheng, for their contribution and assistance throughout this project.

#### REFERENCES

- [1] Mojica, K. 2019. Why team building is important for your business. (October 2019). <https://www.complianceandethics.org/why-team-building-is-important-for-your-business/>
- [2] Scudamore, B. 2016. Why team building is the most important investment you'll make. (March 2016). <https://www.forbes.com/sites/brianscudamore/2016/03/09/why-team-building-is-the-most-important-investment-youll-make/?sh=15870b5617fc>
- [3] Mull-Brooks, J.. 2019. Building Bonds on Teams: How Team Building Positively Impacts Young Athletes . (2019). <https://digitalcommons.usm.maine.edu/cgi/viewcontent.cgi?article=1354&context=etd>
- [4] Tran, Y. (Joey Chen). 2019. How a sport anime relates to Team Building. (August 2019). <https://www.linkedin.com/pulse/how-sport-anime-relates-team-building-y-tran-joey-chen-/>