

CS340 Project Part 6
Group 88
03/17/2025

Marvel Game Statistics Management System

[Marvel Game Statistics Management System](#)

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Executive Summary:

The Marvel Game Statistics Management System has undergone significant improvements based on iterative feedback and testing. The project aimed to create a comprehensive database for tracking players, characters, alliances, and battles in a structured and efficient manner. Through various phases of development, our team refined the database design, user interface, and backend functionality to enhance usability, consistency, and data integrity.

Key Changes and Fixes:

- Form and Data Validation Improvements
 - Numeric fields now restrict text input and values outside of the set constraints.
 - Fields requiring restrictive text inputs now have been standardized to use dropdowns across both Add and Update forms.
 - Nullable relationships when adding and updating a character have now been properly implemented for ammo capacity and alliance.
- User Interface Enhancements
 - Background colors and spacing adjustments were made to improve form readability and distinguish interactive elements like buttons.
 - Delete confirmation screen now displays the entity names and ID's, making it easier for users to confirm their actions.
 - Form elements, such as filter dropdowns, have been resized for better usability, ensuring they do not occupy excessive screen space.
- Backend and Database Refinements
 - ERD, schema, and SQL files have been reviewed and updated for consistency in entity relationships and attribute naming.
 - The DML.sql file has been revised to include only the queries used in the backend, ensuring efficiency and maintainability.

Impact of Changes:

The revisions have significantly improved the system's reliability, user experience, and data integrity. Our project now meets the usability standard, ensuring that the data is correctly formatted, stored, and retrieved efficiently. By addressing the issues and feedback from peers, we have enhanced the overall functionality of our program.

The project is now in its final stage, ready for deployment with a robust backend, a polished UI, and a structured database capable of handling complex game statistics effectively. All changes align with the final grading rubric, ensuring our program's compliance with project requirements and best practices in database management.

Overview:

Marvel Rivals is a competitive online platform where players engage in epic battles using iconic MCU characters and dynamic alliances in a **6v6 player-versus-player**, third-person hero shooter gameplay. With over 350,000 active players annually and 20,000 matches occurring daily, the platform has become a global phenomenon in online gaming. This popularity generates an overwhelming volume of gameplay data, including player rankings, character performance, alliance interactions, and match statistics. Additionally, the MCU is immense and the developers plan on adding new characters every 45 days. The sheer scale of activity and incoming content demands a sophisticated solution to efficiently manage and store this critical data while supporting the platform's growing player base.

To address this challenge, the Datavengers Database will serve as the backbone for tracking and managing all player and gameplay metrics. This system will store detailed records of Players, Characters, Alliances, and Battles, ensuring seamless retrieval and analysis of information. By leveraging the database, Marvel Rivals can provide advanced insights to stakeholders, enhance player engagement through performance tracking, and scale effortlessly to support up to 700,000 concurrent players and new characters. The Datavengers Database will streamline data management and empower future innovations for the platform.

Database Outline:

Players:

- Purpose:
 - To store player information such as identity, rank, and battle participation.
- Attributes:
 - **player_id** (INT, Auto Increment, Unique, Not NULL, Primary Key)
 - **player_name** (VARCHAR(145), Not NULL)
 - **rank** (VARCHAR(45), Not NULL)
- Relationships:
 - **M:N with Battles (via PlayerBattles):** Each player can participate in multiple battles.

- **M:N with Characters:** (via a join table called **PlayerCharacters**) Many characters can be played by a single player, and many players can play a single character.

Characters:

- Purpose:
 - To manage details of playable characters, including attributes, abilities, and roles.
- Attributes:
 - **character_id** (INT, Auto Increment, Unique, Not NULL, Primary Key)
 - **character_name** (VARCHAR(100), Not NULL)
 - **role** (VARCHAR(45), Not NULL)
 - **health** (INT, Not NULL)
 - **has_secondary_weapon** (TINYINT(1), Not NULL, Default 0)
 - **move_speed** (INT, Not NULL)
 - **critical_multiplier** (FLOAT, Not NULL)
 - **ammo_capacity** (INT, Nullable)
 - **track_alliance** (INT, Foreign Key referencing **Alliances** (alliance_id))
- Relationships:
 - **1:M with Abilities:** (implemented via **track_character** FK in **Abilities** referencing **Characters**) Each character can have multiple unique abilities.
 - **M:N with Battles:** (via a join table called **BattleParticipants**): (implemented via **track_character** FK in **BattleParticipants** referencing **Characters**) A character can participate in multiple battles, and each battle can involve multiple characters.
 - **M:1 with Alliances:** Characters can belong to one alliance.
 - **M:N with Player:** (via a join table called **PlayerCharacters**) Many characters can be played by a single player, and many players can play a single character.

Abilities:

- Purpose:
 - To track unique character abilities, including their effects and usage in gameplay.
- Attributes:
 - **ability_id** (INT, Auto Increment, Unique, Not NULL, Primary Key)
 - **ability_name** (VARCHAR(45), Not NULL)

- **special_effect** (VARCHAR(145), Not NULL)
 - **ability_range** (INT, Not NULL, Default 0)
 - **cooldown** (INT, Not NULL, Default 0)
 - **duration** (INT, Not NULL, Default 0)
 - **charges** (INT, Default NULL)
 - **track_character**(INT, NOT NULL Foreign Key referencing **Characters** (character_id))
- Relationships:
 - **M:1 with Characters:** Each ability belongs to one character.

Alliances:

- Purpose:
 - To group characters into alliances and manage alliance-specific abilities and boosts. Note: the alliance size is at least 2 characters and max 3 characters.
- Attributes:
 - **alliance_id** (INT, Auto Increment, Unique, Not NULL, Primary Key)
 - **alliance_name** (VARCHAR(55), Not NULL)
 - **stat_boost** (Decimal(30, 2), Not NULL)
 - **stat_boost_type** (VARCHAR(45), Not NULL)
- Relationships:
 - **1:M with Characters:** (implemented via **track_alliances** FK in **Characters** referencing **Alliances**) Each alliance can include multiple characters.

Battles:

- Purpose:
 - To record battle details, including outcomes, player stats, and character involvement.
- Attributes:
 - **battle_id** (INT, Auto Increment, Unique, Not NULL, Primary Key)
 - **time_stamp** (DATETIME, Not NULL)
 - **is_victory** (TINYINT(1), Not NULL)
 - **kills** (INT, Not NULL, Default 0)
 - **deaths** (INT, Not NULL, Default 0)
 - **assists** (INT, Not NULL, Default 0)
 - **damage_dealt** (BIGINT(200000), Not NULL, Default 0)
 - **damage_blocked** (BIGINT(200000), Not NULL, Default 0)
 - **healing** (BIGINT(200000), Not NULL, Default 0)

- **accuracy** (INT, Default 0)
- Relationships:
 - **M:N with Players** (via **PlayerBattles**): (implement via **track_battle** in **PlayerBattles** referencing **Battles**) Each battle has many players and each player can be in many battles.
 - **M:N with Characters** (via **BattleParticipants**): (implement via **track_character** in **BattleParticipants** referencing **Battles**) A single battle can involve multiple characters, and each character can participate in multiple battles.

BattleParticipants (intersection table):

- Purpose:
 - An intersection table that links battles and characters, indicating what characters took part in each battle.
- Attributes:
 - **track_battle** (INT, Foreign Key referencing **Battles** (battle_id))
 - **track_character**(INT, Foreign Key referencing **Characters**(character_id))
- Relationships:
 - This table works as an intermediary between the relationship below.
 - **M:N Relationship between Characters and Battles:** A single battle can involve multiple characters, and each character can participate in multiple battles.

PlayerBattles (intersection table):

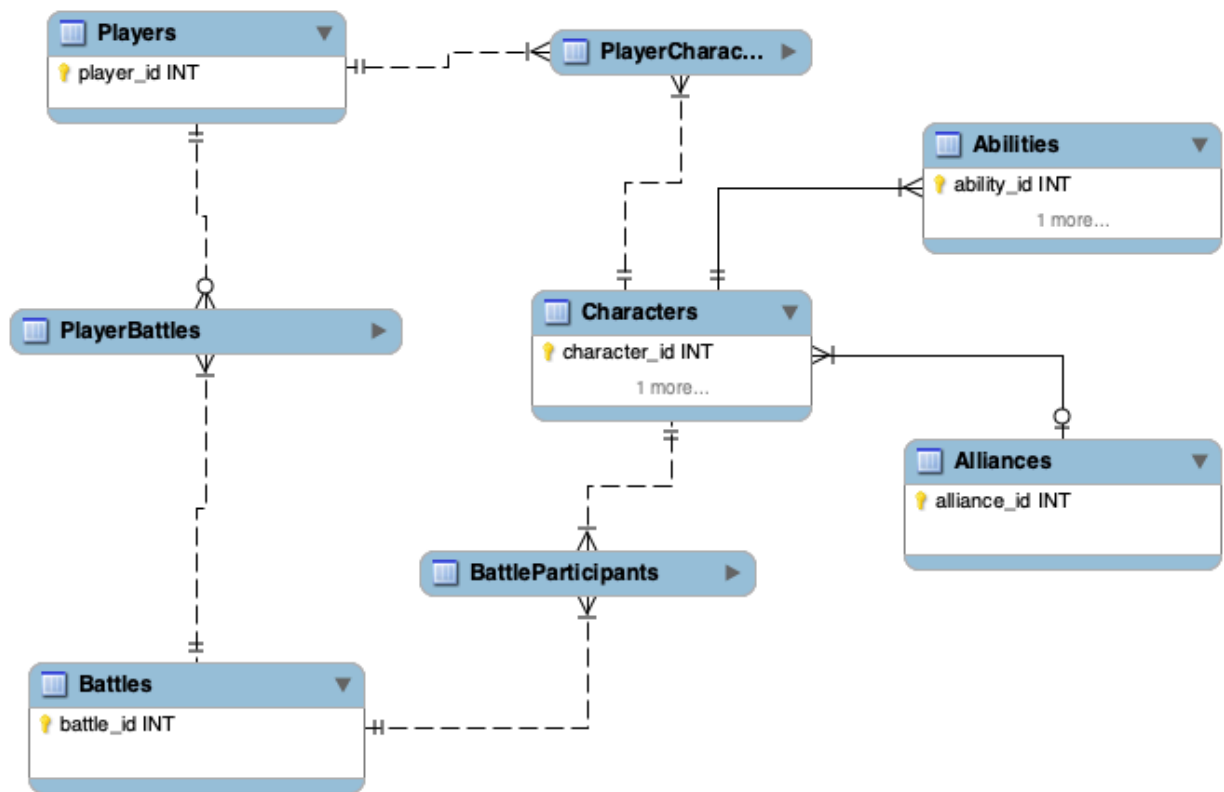
- Purpose:
 - An intersection table that links battles and players indicates that multiple players took part in each battle and that there are numerous battles.
- Attributes:
 - **track_battle** (INT, Foreign Key referencing **Battles** (battle_id))
 - **track_player**(INT, Foreign Key referencing **Players** (player_id))
 - PRIMARY KEY (track_battle, track_player)
- Relationships:
 - This table works as an intermediary between the relationship below.
 - **M:N Relationship between Players and Battles:** A single battle can involve multiple players, and each player can participate in multiple battles.

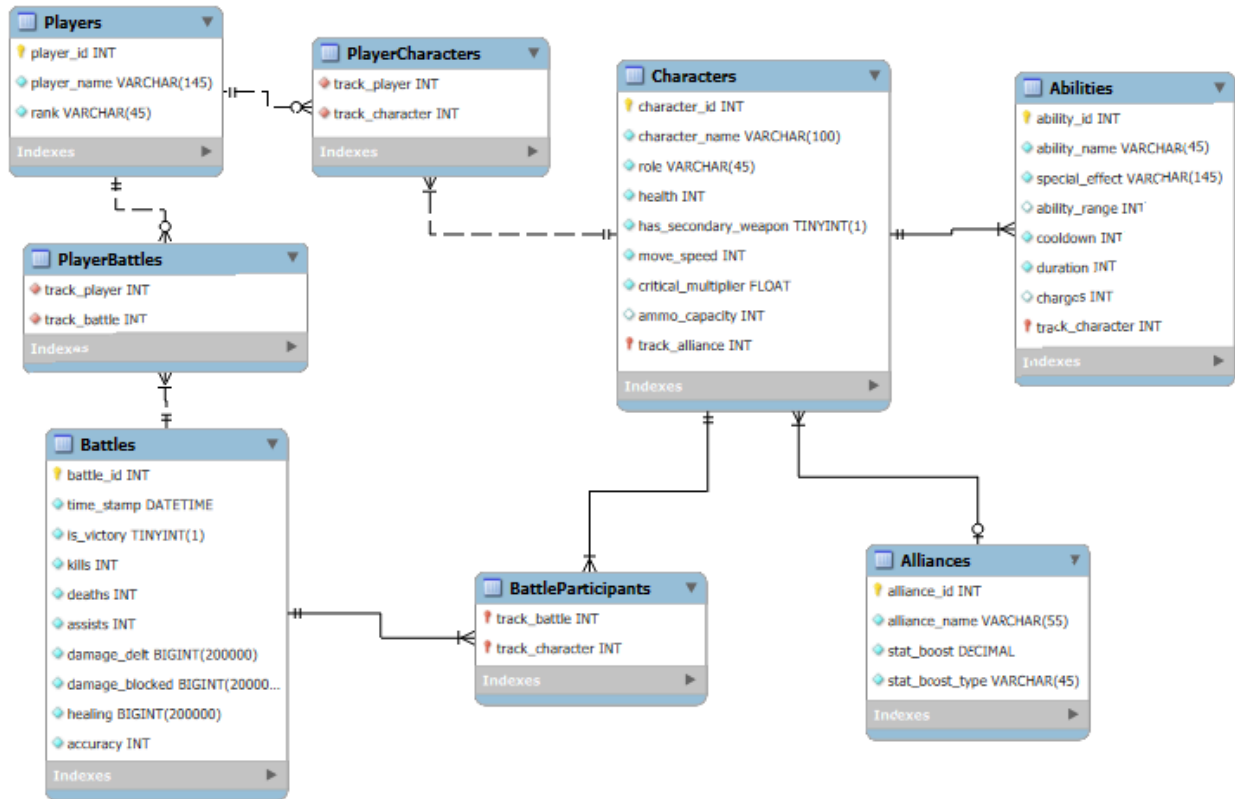
PlayerCharacters (intersection table):

- Purpose:

- An intersection table that links characters and players indicates that multiple players can play each character and a single player can play many characters.
- Attributes:
 - **track_player**(INT, Foreign Key referencing **Players** (player_id))
 - **track_character** (INT, Foreign Key referencing **Characters** (character_id))
 - PRIMARY KEY (track_player, track_character)
- Relationships:
 - This table works as an intermediary between the relationship below.
 - **M:N Relationship between Players and Characters:** Multiple players can play each character and a single player can play many characters.

Entity-Relationship Diagram:



Schema:

Example Data:

Players			
	player_id	player_name	rank
	4	Zyverous	Diamond
	5	MasterMo	Celestial
	6	GamerDad	Gold

Characters									
	character_id	character_name	role	health	has_secondary_weapon	move_speed	critical_multiplier	ammo_capacity	track_alliance
	4	Iron Man	Duelist	275	0	10	0	8	6
	5	Venom	Vanguard	650	0	15	15	NULL	5
	6	Rocket	Strategist	250	1	15	25	30	7

Abilities								
	ability_id	ability_name	special_effect	ability_range	cooldown	duration	charges	track_character
	5	Hyper-Velocity	Activate Hyper-Velocity state for swift forward flight	0	8	5	1	4
	6	Symbiotic Resilience	Laungh webbing forward, allowing for a singlar swing in desired direction	100	10	0	0	5
	7	Jetpack Dash	Dash forward	0	7	1	2	6
	8	Battle Rebirth Beacon	Deploy beacon to revive fallen ally and periodically drops armor packs	50	45	100	1	6

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Alliances				
	alliances_id	alliances_name	stat_boost	stat_boost_type
	5	Symbiote Bond	15.00	Attack Power
	6	Gamma Charge	20.00	Health Boost
	7	Ammo Overload	25.00	Attack Power
	8	Lunar Focus	15.00	Healing Boost

Battles										
	battle_id	time_stamp	is_victory	kills	deaths	assists	damage_dealt	damage_blocked	healing	accuracy
	4	2025-02-05 15:30:00	1	45	2	3	100000	5000	2000	51
	5	2025-02-05 16:00:00	0	3	14	2	800	3000	1000	5
	6	2025-02-05 16:30:00	1	6	1	44	2500	7000	5570	90

BattleParticipants		
	track_battle	track_character
	4	6
	4	4
	4	5
	5	4
	6	5

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PlayerBattles		
	track_player	track_battle
	4	4
	5	4
	6	5
	4	6

PlayerCharacters		
	track_player	track_character
	4	4
	4	6
	5	5
	6	6

UI Screenshots:

Players Page:

READ all Players

New		Player ID	Player	Rank
Edit	Delete	4	Zyverous	Diamond
Edit	Delete	5	MasterMo	Celestial
Edit	Delete	6	GamerDad	Gold

CREATE a New Players

Add a New Player

Player Name

Rank

Eternal

Add Player

Cancel

UPDATE an existing Players (noticed the grayed out field is not editable)

Edit Player

Player ID

Player Name

Rank

Diamond

Save Changes

Cancel

DELETE An Existing Player

Are you sure you
want to delete this
player?

Player ID: 4

Player Name: Zyverous

Delete

Cancel

Battles Page:

READ all battles

New		Battle ID	Time Stamp	Victory	Kills	Deaths	Assists	Damage Dealt	Damage Blocked	Healing	Accuracy
Edit	Delete	4	Wed Feb 05 2025 15:30:00 GMT-0800 (Pacific Standard Time)	true	45	2	3	100000	5000	2000	51
Edit	Delete	5	Wed Feb 05 2025 16:00:00 GMT-0800 (Pacific Standard Time)	false	3	14	2	800	3000	1000	5
Edit	Delete	6	Wed Feb 05 2025 16:30:00 GMT-0800 (Pacific Standard Time)	true	6	1	44	2500	7000	5570	90

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CREATE a New Battle

Add a New Battle

Time Stamp

03/17/2025, 12:30 PM

Is Victory?

true

Kills

Deaths

Assists

Damage Dealt

Damage Blocked

Healing

Accuracy

Add Battle

Cancel

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UPDATE An Existing Battle

Battle ID

4

Time Stamp

02/05/2025, 11:30 PM

Is Victory

true

Kills

45

Deaths

2

Assists

3

Damage Dealt

100000

Damage Blocked

5000

Healing

2000

Accuracy

51

Save Changes

Cancel

**Are you sure you
want to delete this
battle?**

Battle ID: 4

Time Stamp: Wed Feb 05
2025 15:30:00 GMT-0800
(Pacific Standard Time)

Delete

Cancel

Characters Page

READ all Characters (Notice the ammo capacity on the second row and alliance on the third row is empty. Character has a nullable relationship with Alliance!)

New		Character ID	Character	Role	Health	Has Secondary Weapon	Move Speed	Critical Multiplier	Ammo Capacity	Alliance
Edit	Delete	4	Iron Man	Duelist	275	No	10	0	8	Gamma Charge
Edit	Delete	5	Venom	Vanguard	650	No	15	15		Symbiote Bond
Edit	Delete	6	Rocket	Strategist	250	Yes	10	25	30	

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CREATE a New Character (since ammo capacity and alliance are nullable, those field are optional, but ammo capacity will be default to zero.)

Add a New Character

Character Name

Enter character's name

Role

Choose a role

Health

100

Has Secondary Weapon

No

Move Speed

1

Critical Multiplier

0

Ammo Capacity

0

Track Alliance

None

Cancel

Add Character

**Are you sure you
want to delete this
character?**

Character ID: 4

Character Name: Iron Man

Cancel

Delete

Ability Page

UI screenshots are omitted due to the CRUD operations similarity with Character, except that the Ability's relationship with Character is not nullable.

Alliance Page

CR operation UI screenshots are omitted due to the CRUD operations similarity with Players.

UPDATE An Alliance

New		Alliance ID	Alliance	Stat Boost	Stat Boost Type
Edit	Delete	5	Symbiote Bond	15	Attack Power
Edit	Delete	6	Gamma Charge	20	Health Boost
Edit	Delete	7	Ammo Overload	25	Attack Power
Edit	Delete	8	Lunar Focus	15	Healing Boost
Edit	Delete	10	The Trio	10	Magic Power

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Changing the alliance name to: The Quadrio

Edit Alliance

Alliance ID

Alliance Name

Stat Boost

Stat Boost Type

The updated alliance name also reflects in Character's page.

New		Character ID	Character	Role	Health	Has Secondary Weapon	Move Speed	Critical Multiplier	Ammo Capacity	Alliance
<input type="button" value="Edit"/>	<input type="button" value="Delete"/>	4	Iron Man	Duelist	275	No	10	0	8	Gamma Charge
<input type="button" value="Edit"/>	<input type="button" value="Delete"/>	5	Venom	Vanguard	650	No	15	15		Symbiote Bond
<input type="button" value="Edit"/>	<input type="button" value="Delete"/>	6	Rocket	Strategist	250	Yes	10	25	30	
<input type="button" value="Edit"/>	<input type="button" value="Delete"/>	8	Tester	Strategist	100	No	1	0		The Quadrio

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DELETE An Alliance

Before deleting the Alliance: The Trio (below is the Characters table)

New		Character ID	Character	Role	Health	Has Secondary Weapon	Move Speed	Critical Multiplier	Ammo Capacity	Alliance
Edit	Delete	4	Iron Man	Duelist	275	No	10	0	8	Gamma Charge
Edit	Delete	5	Venom	Vanguard	650	No	15	15		Symbiote Bond
Edit	Delete	6	Rocket	Strategist	250	Yes	10	25	30	
Edit	Delete	7	Tester	Strategist	100	No	1	0	100	The Trio

Deleting the alliance: The Trio

Are you sure you want to delete this alliance?

Alliance ID: 9

Alliance Name: The Trio

Delete

Cancel

After deleting The Trio Alliance (below is the Characters table)

New		Character ID	Character	Role	Health	Has Secondary Weapon	Move Speed	Critical Multiplier	Ammo Capacity	Alliance
Edit	Delete	4	Iron Man	Duelist	275	No	10	0	8	Gamma Charge
Edit	Delete	5	Venom	Vanguard	650	No	15	15		Symbiote Bond
Edit	Delete	6	Rocket	Strategist	250	Yes	10	25	30	
Edit	Delete	7	Tester	Strategist	100	No	1	0	100	

BattleParticipant Page

READ all PlayerBattles (this is an intersection table helped to represent the M:N relationship between Players and Battles)

New		Battle	Time Stamp	Character
Edit	Delete	6	Wed Feb 05 2025 16:30:00 GMT-0800 (Pacific Standard Time)	Venom
Edit	Delete	5	Wed Feb 05 2025 16:00:00 GMT-0800 (Pacific Standard Time)	Iron Man
Edit	Delete	4	Wed Feb 05 2025 15:30:00 GMT-0800 (Pacific Standard Time)	Venom
Edit	Delete	4	Wed Feb 05 2025 15:30:00 GMT-0800 (Pacific Standard Time)	Rocket
Edit	Delete	4	Wed Feb 05 2025 15:30:00 GMT-0800 (Pacific Standard Time)	Iron Man

UPDATE a BattleParticipant (Attempting to update to an existing record will result in failure as it will be duplicating entry)

Edit Player Battle

Track Player

Zyverous

Track Battle

- ✓ Battle ID: 4 | Wed Feb 05 2025 15:30:00 GMT-0800 (Pacific Standard Time)
- Battle ID: 5 | Wed Feb 05 2025 16:00:00 GMT-0800 (Pacific Standard Time)
- Battle ID: 6 | Wed Feb 05 2025 16:30:00 GMT-0800 (Pacific Standard Time)

Save Changes

Cancel

Edit Battle Participant

Track Battle

Battl ID: 4 - Wed Feb

Track Character

Venom

Save Changes

Duplicate entry

Close

PlayerBattles Page

UI screenshots are omitted due to the CRUD operations similarity with BattleParticipants.

PlayerCharacters Page

UI screenshots are omitted due to the CRUD operations similarity with BattleParticipants