CPSC 304 Project Cover Page

Milestone #: 4

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Group Number: 60

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

Description

Our project involves designing a database to represent a system that manages games of various types, tracks player statistics, supports player profiles, and leaderboard tracking for each game. We are aiming to model how a company might want to handle and track data related to the games they provide and the players that play them. For example, game platforms such as Steam that host different amounts of games, and players can access it all in one place.

Our project accomplished our goal of completing an end-to-end system that allowed the user to "sign-in" to the game management system, then access their profile and see all the games that are available to them. They can explore greater information about the game they want to play such as the Developer Company, or Publisher.

Current Schema

        The current schema differs from our original ER diagram outlined in Milestone 1 due to a few small adjustments and two significant changes. The larger modifications include the merging of two entities, removal of a many-to-many relationship, and the decomposition of an entity.

        The smaller differences include the addition of attributes aimed to specifically identify the entity and serve as their primary key. An example would be introducing the key 'PlayerID' to uniquely determine a Player. Another adjustment involved the relationship between Publisher and Game, originally defined to be many-to-many with a participation constraint on the side of the Game. Although this constraint could be maintained after learning more about assertions in the SQL module, through further consideration, we decided to model the relationship as a one-to-many relationship such that a Game only has one Publisher, reflecting the typical real-world scenario where a game is published by a single company. As well, we previously did not have a partial key for our weak entity, so we identified that to be the "rank" attribute.

        Upon further discussion regarding the behaviour and intent behind the PlayerProfile entity, we discovered its redundancy. As the entity PlayerProfile had only one non-recursive relationship with Player, which had both a key and participation constraint denoting exactly one, merging PlayerProfile and Player seemed much more logical. We could do this because Player and PlayerProfile are one-to-one. Additionally, the combination of these two entities works well because a Player only has one PlayerProfile across all Games, meaning that PlayerProfile never interacts with other relations directly than itself or Player. Thus, the first change is the removal of the entity PlayerProfile. After merging the two entities, the self-referencing relationship that PlayerProfile had became a self-referencing relationship for Player between Player 1 and Player 2.

        The second difference between our original and current schema is the removal of the relationship between DeveloperCompany and Publisher. In game production, it is not necessarily the case that a developing company works for the publisher or vice versa, as seen with independent contracting companies. Therefore, in order to more accurately model real-world relationships between these companies, we decided that removing the relationship would enhance comprehensibility and generalize the representation of our schema to the real-world.

        The last modification is the decomposition of the table Game into two relations that satisfy 3NF, Game and Genre. To make a more meaningful decomposition into 3NF, we added another functional dependency to Game: ageRestriction and MultiplayerGame: serverRegion. Now, we created a meaningful dependency as Genre and Server determines what the ageRestriction of a game will be and serverRegion determines what the voiceChatProvider will be. For example, violent horror games will have an ageRestriction of R for Restricted, while a

farming RPG will have an ageRestriction or rating of E for Everyone. Another example is that if an 'America-1001' server would be provided by a voice chat 'Voices'.

Schema Screenshots and Data
Schema:
> Publisher (<u>publisherID</u>, publisherName)
> Genre (<u>genre</u>, ageRestriction)
> Game (<u>gameID</u>, title, **genre**, releaseDate, platform)
> SinglePlayerGame (**<u>gameID</u>**, difficulty)
> Server (<u>serverRegion</u>, voiceChatProvider)
> MultiplayerGame (**<u>gameID</u>**, **serverRegion**)
> Leaderboard (<u>leaderboardID</u>, visibility, timeFrame, **gameID**)
> DeveloperCompany (<u>developerID</u>, developerName, hqCity)
> Player (<u>playerID</u>, playerEmail, dateOfBirth, rank, avatar, bio)
> Statistic (**<u>playerID</u>**, <u>rank</u>, score)
> Team (<u>teamID</u>, creationDate)
> DeveloperGame (**<u>developerID</u>**, **<u>gameID</u>**)
> PublisherGame (**<u>publisherID</u>**, **<u>gameID</u>**)
> LeaderboardStatistic (**<u>leaderboardID</u>**, **<u>playerID</u>**, **<u>rank</u>**)
> GameTeam (**<u>gameID</u>**, **<u>teamID</u>**)
> TeamPlayer (**<u>playerID</u>**, **<u>teamID</u>**)
> GamePlayer (**<u>playerID</u>**, **<u>gameID</u>**)
> Friend (**<u>playerID1</u>**, **<u>playerID2</u>**)

Tuples in each Relation:
> Publisher (<u>publisherID</u>, publisherName)

```
PUBLISHERID PUBLISHERNAME
----------- --------------------
          1 Ink Splatter Press
          2 Game Publishers
          3 Wonderful Whimsy
          4 Reach for the Stars
          5 Midnight Flourish
```

> Genre (<u>genre</u>, ageRestriction)

```
GENRE               AGERESTRICTION
------------------- --------------------
FPS Shooter         T
Adventure RPG       E
Action RPG          A
MOBA                T
Strategy            E
```

> Game (<u>gameID</u>, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        1 Maple Story
Adventure RPG         10-OCT-23 iOS

        2 League of Legends
MOBA                  10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter           10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        4 TeamFight Tactics
Strategy              10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC


    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        7 Assassins Creed Valhalla
Action RPG            10-OCT-23 Xbox

        8 The Legend of Zelda: Breath of the Wild
Adventure RPG         10-OCT-23 Nintendo Switch

        9 Cyberpunk 2077
Action RPG            10-OCT-23 PC
```

```
    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
       10 Red Dead Redemption 2
Action RPG            10-OCT-23 PlayStation

       12 test
FPS Shooter           30-NOV-23 PC
```

SinglePlayerGame (**gameID**, difficulty)

```
GAMEID DIFFICULTY
---------- ----------
         6          6
         7          8
         8         10
         9          9
        10          3
        12         10
```

Server (serverRegion, voiceChatProvider)

```
SERVERREGION           VOICECHATPROVIDER
--------------------   --------------------
America-1001           Voices
America-1002           VoicePro
America-1003           TeamSpeak
America-1004           Noise
America-1005           Mumble
```

MultiplayerGame (**gameID**, **serverRegion**)

```
    GAMEID SERVERREGION
---------- --------------------
         1 America-1001
         2 America-1002
         3 America-1003
         4 America-1004
         5 America-1005
```

Leaderboard (leaderboardID, visibility, timeFrame, **gameID**)

```
LEADERBOARDID VISIBILITY TIMEFRAME
------------- ---------- ------------------------------------------------
    GAMEID
----------
          1          1 2023-10-12 - 2023-10-19
         1

          2          1 2023-10-12 - 2023-10-19
         2

          3          1 2023-10-12 - 2023-10-19
         3


LEADERBOARDID VISIBILITY TIMEFRAME
------------- ---------- ------------------------------------------------
    GAMEID
----------
          4          0 2023-10-12 - 2023-10-19
         4

          5          1 2023-10-12 - 2023-10-19
         5

          6          1 2023-10-12 - 2023-10-19
         6
```

```
LEADERBOARDID VISIBILITY TIMEFRAME
------------- ---------- ------------------------------------------------
    GAMEID
----------
         7          1 2023-10-12 - 2023-10-19
      7

         8          1 2023-10-12 - 2023-10-19
      8

         9          0 2023-10-12 - 2023-10-19
      9


LEADERBOARDID VISIBILITY TIMEFRAME
------------- ---------- ------------------------------------------------
    GAMEID
----------
        10          1 2023-10-12 - 2023-10-19
     10
```

DeveloperCompany (developerID, developerName, hqCity)

```
DEVELOPERID DEVELOPERNAME          HQCITY
----------- ---------------------- --------------------
          1 Awesome Games          Calgary
          2 Cool Games             Vancouver
          3 Machine Games          Toronto
          4 Riot                   LA
          5 Blizzard               NYC
```

Player (playerID, playerEmail, dateOfBirth, rank, avatar, bio)

```
  PLAYERID PLAYEREMAIL                   DATEOFBIR       RANK
---------- ----------------------------- --------- ----------
AVATAR
-------------------------------------------------
BIO
-------------------------------------------------
         1 grace@gmail.com               10-OCT-02          1
/path/to/avatar1.jpg
Gamer, explorer, and thrill-seeker.

         2 sophie@gmail.com              23-OCT-02          2
/path/to/avatar2.jpg
Casual gamer

  PLAYERID PLAYEREMAIL                   DATEOFBIR       RANK
---------- ----------------------------- --------- ----------
AVATAR
-------------------------------------------------
BIO
-------------------------------------------------
         3 audrey@gmail.com              20-NOV-03          3
/path/to/avatar3.jpg
competitive.

         4 jane@gmail.com                30-APR-03          4
/path/to/avatar4.jpg
```

```
  PLAYERID PLAYEREMAIL                         DATEOFBIR       RANK
---------- ----------------------------- --------- ----------
AVATAR
--------------------------------------------------
BIO
--------------------------------------------------
live laugh love.

         5 sam@gmail.com                  10-MAY-03          5
/path/to/avatar5.jpg
i will win
```

Statistic (**playerID**, <u>rank</u>, score)

```
 PLAYERID        RANK       SCORE
---------- ---------- ----------
         1         200       49988
         2           7     2020204
         3           1     8000878
         4          20     4482748
         5        9000         434
```

Team (<u>teamID</u>, creationDate)

```
    TEAMID CREATIOND
---------- ---------
         1 10-MAY-03
         2 07-JUN-18
         3 14-JAN-21
         4 13-DEC-22
         5 10-MAY-13
```

DeveloperGame (**developerID**, **gameID**)

```
DEVELOPERID      GAMEID
---------- ----------
         1           1
         1           2
         2           3
         2           4
         3           5
         3           6
         4           7
         4           8
         5           9
         5          10
```

PublisherGame (**publisherID**, **gameID**)

```
PUBLISHERID      GAMEID
-----------   ----------
          1            1
          1            2
          2            3
          2            4
          3            5
          3            6
          4            7
          4            8
          5            9
          5           10
```

LeaderboardStatistic (**leaderboardID**, **playerID**, **rank**)

```
LEADERBOARDID    PLAYERID          RANK
-------------  ----------   -----------
            1            1           200
            2            2             7
            3            3             1
            4            4            20
            5            5          9000
```

GameTeam (**gameID**, **teamID**)

```
    GAMEID        TEAMID
----------    ----------
         1             1
         1             2
         2             3
         2             4
         2             5
```

TeamPlayer (**playerID**, **teamID**)

```
  PLAYERID        TEAMID
----------    ----------
         1             1
         1             2
         1             5
         2             1
         2             2
         3             3
         3             4
         3             5
         4             4
         5             4
```

GamePlayer (**playerID**, **gameID**)

```
   PLAYERID      GAMEID
---------- ----------
         1          1
         2          1
         3          1
         4          1
         5          1
         5          2
         5          3
         5          4
         5          5
         5          6
         5          7

   PLAYERID      GAMEID
---------- ----------
         5          8
         5          9
         5         10
```

Friend (**playerID1**, **playerID2**)

```
PLAYERID1  PLAYERID2
---------- ----------
         1          2
         2          3
         3          4
         4          5
         5          3
```

SQL Queries

d. A list of all SQL queries used and where it can be found in the code (i.e., file name and line number(s)). For SQL query requirements, check the rubric listed on Canvas for Milestone 4. e. Screenshots demonstrating the functionality of each query using the GUI. We want to see a before/during/after progression of events.

For example, the before screenshot would be what data is in the table before you run the query, the during screenshot(s) is how the query is triggered using the GUI, and the after screenshot is what data is in your table afterwards.

Please label each set of screenshots with the name of the query it is meant to address (e.g., "Insert Operation"). You need only to include screenshots for the required queries – if you implemented more than what was required, screenshots are not needed for those extra queries.

INSERT (Game)
File: appService.js
Line: 131

Before:Game (gameID, title, **genre**, releaseDate, platform)

```
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         1 Maple Story
Adventure RPG         10-OCT-23 iOS

         2 League of Legends
MOBA                  10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter           10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- ----------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         4 TeamFight Tactics
Strategy              10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC


    GAMEID TITLE
---------- ----------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG            10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG         10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG            10-OCT-23 PC


    GAMEID TITLE
---------- ----------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        10 Red Dead Redemption 2
```

```
     GAMEID TITLE
---------- --------------------------------------------------
GENRE                 RELEASEDA PLATFORM
------------------- --------- --------------------
       10 Red Dead Redemption 2
Action RPG              10-OCT-23 PlayStation
```

During:

After:

```
        8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

        9 Cyberpunk 2077
Action RPG           10-OCT-23 PC


     GAMEID TITLE
---------- --------------------------------------------------
GENRE                 RELEASEDA PLATFORM
------------------- --------- --------------------
       10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation

       23 New Game
Adventure RPG        24-DEC-02 Microsoft


11 rows selected.

SQL>
```

DELETE
File: appService.js
Line: 154

Before: Game (<u>gameID</u>, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
        1 Maple Story
Adventure RPG         10-OCT-23 iOS

        2 League of Legends
MOBA                  10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter           10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
        4 TeamFight Tactics
Strategy              10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC


    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
        7 Assassins Creed Valhalla
Action RPG            10-OCT-23 Xbox

        8 The Legend of Zelda: Breath of the Wild
Adventure RPG         10-OCT-23 Nintendo Switch

        9 Cyberpunk 2077
Action RPG            10-OCT-23 PC
```
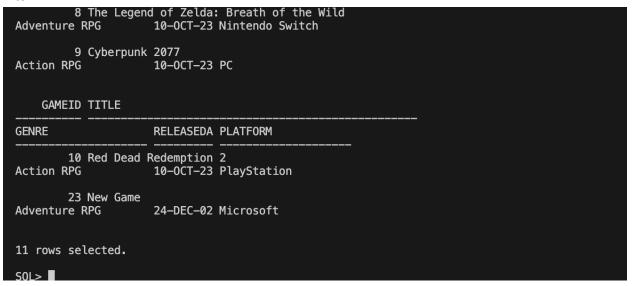
```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
       10 Red Dead Redemption 2
Action RPG            10-OCT-23 PlayStation

       12 test
FPS Shooter           30-NOV-23 PC
```

(Single Player Game)

```
    GAMEID  DIFFICULTY
_____  _____
         6            6
         7            8
         8           10
         9            9
        10            3
        12           10

6 rows selected.
```

During:

Filter Games: Select an option   You have selected:

Add Game   12

            Delete Game   DELETE request successful:

Please fill out the information below to Add Your Desired Game:

            Game ID: 23

            Title: New Game

After:

```
select * from game;

    GAMEID TITLE
---------- --------------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         1 Maple Story
Adventure RPG        10-OCT-23 iOS

         2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- --------------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC


    GAMEID TITLE
---------- --------------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG           10-OCT-23 PC


    GAMEID TITLE
---------- --------------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation


10 rows selected.
```
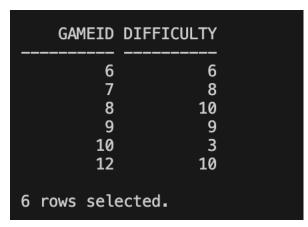
```
  GAMEID DIFFICULTY
---------- ----------
       6          6
       7          8
       8         10
       9          9
      10          3
```

(Single Player Game)

UPDATE
File: appService.js
 264, 281

Before:


```
   PLAYERID PLAYEREMAIL                     DATEOFBIR       RANK
---------- ---------------------------- --------- ----------
AVATAR
-----------------------------------------------
BIO
-----------------------------------------------
         1 grace@gmail.com              10-OCT-02          1
/path/to/avatar1.jpg
Gamer, explorer, and thrill-seeker.

         2 sophie@gmail.com             23-OCT-02          2
/path/to/avatar2.jpg
Casual gamer
   PLAYERID PLAYEREMAIL                     DATEOFBIR       RANK
---------- ---------------------------- --------- ----------
AVATAR
-----------------------------------------------
BIO
-----------------------------------------------
         3 audrey@gmail.com             20-NOV-03          3
/path/to/avatar3.jpg
competitive.
         4 jane@gmail.com               30-APR-03          4
/path/to/avatar4.jpg
```



```
   PLAYERID PLAYEREMAIL                     DATEOFBIR       RANK
---------- ---------------------------- --------- ----------
AVATAR
-----------------------------------------------
BIO
-----------------------------------------------
live laugh love.
         5 sam@gmail.com                10-MAY-03          5
/path/to/avatar5.jpg
i will win
```

During:

Here are all your accounts, choose one to sign in and you can further modify your profiles!

id	email	date	rank	avatar	bio
1	grace@gmail.com	2002-10-10T07:00:00.000Z	1	/path/to/avatar1.jpg	Gamer, explorer, and thrill-seeker.
2	sophie@gmail.com	2002-10-23T07:00:00.000Z	2	/path/to/avatar2.jpg	Casual gamer
3	audrey@gmail.com	2003-11-20T08:00:00.000Z	3	/path/to/avatar3.jpg	competitive.
4	jane@gmail.com	2003-04-30T07:00:00.000Z	4	/path/to/avatar4.jpg	live laugh love.
5	sam@gmail.com	2003-05-10T07:00:00.000Z	5	/path/to/avatar5.jpg	i will win

Email: grace@gmail.com

Sign In

Never logged in before?

Sign up instead

Here are all your accounts, choose one to sign in and you can further modify your profiles!

id	email	date	rank	avatar	bio
1	grace@gmail.com	2002-10-10T07:00:00.000Z	1	/path/to/avatar1.jpg	Gamer, explorer, and thrill-seeker.
2	sophie@gmail.com	2002-10-23T07:00:00.000Z	2	/path/to/avatar2.jpg	Casual gamer
3	audrey@gmail.com	2003-11-20T08:00:00.000Z	3	/path/to/avatar3.jpg	competitive.
4	jane@gmail.com	2003-04-30T07:00:00.000Z	4	/path/to/avatar4.jpg	live laugh love.
5	sam@gmail.com	2003-05-10T07:00:00.000Z	5	/path/to/avatar5.jpg	i will win

Email: grace@gmail.com

Successfully signed in!

Go to profile

Sign In

300 × 300

Email: grace@gmail.com

Avatar:
changing my bio!

Edit button

Success! Your old avatar was: /path/to/avatar1.jpg. You can verify changes in the Query Available Game Tables.

All Game Ranking

Game 1	Rank 1
Game 2	Rank 2

Bio:
Click the button to edit me!

After:

```
select * from player;

  PLAYERID PLAYEREMAIL                    DATEOFBIR      RANK
---------- ------------------------------ ---------- ----------
AVATAR
--------------------------------------------------------------
BIO
--------------------------------------------------------------
         1 grace@gmail.com                10-OCT-02           1
changing my bio!
Gamer, explorer, and thrill-seeker.

         2 sophie@gmail.com               23-OCT-02           2
/path/to/avatar2.jpg
Casual gamer

  PLAYERID PLAYEREMAIL                    DATEOFBIR      RANK
---------- ------------------------------ ---------- ----------
AVATAR
--------------------------------------------------------------
BIO
--------------------------------------------------------------
```

In this update query, we have made a deliberate decision to restrict the update options available. Specifically, a user is now only able to update their biography and avatar. This choice stems from recognizing that modifications of a player's email and date of birth tend to be impractical and unavailable across many platforms. Furthermore, we choose to enforce this logical limitation within our database to ensure that it aligns with the real-world practices.

SELECTION (WHERE Clause)
File: appService.js
Line: 338

Before:Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        1 Maple Story
Adventure RPG        10-OCT-23 iOS

        2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC


    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

        8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

        9 Cyberpunk 2077
Action RPG           10-OCT-23 PC
```

```
    GAMEID TITLE
---------- ---------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
       10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation

       12 test
FPS Shooter          30-NOV-23 PC
```

During:

Filter Games: Select an option   You have selected:

Adventure RPG
Action RPG
Strategy
MOBA
FPS Shooter

Filter Games: Adventure RPG   You have selected: **Adventure RPG**

Adventure RPG
Action RPG
Strategy   t here
MOBA
FPS Shooter

300 × 300   300 × 300   300 × 300   300 × 300

Maple Story   **Genshin Impact**   **The Witcher 3: Wild Hunt**   **The Legend of Zelda: Breath of the Wild**

Filter Games: [Strategy] You have selected: **Adventure RPG**   **Strategy**

[Add Game]   [Enter text here]
                [Delete Game]

Maple Story

TeamFight Tactics

Genshin Impact

The Witcher 3: Wild Hunt

The Legend of Zelda: Breath of the Wild

After: Unchanged Relation

Game (<u>gameID</u>, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        1 Maple Story
Adventure RPG        10-OCT-23 iOS

        2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC
```

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG           10-OCT-23 PC


    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation
```

JOIN
File: appService.js
Line: 410

Before:
Genre (genre, ageRestriction)

```
GENRE                AGERESTRICTION
-------------------- --------------------
FPS Shooter          T
Adventure RPG        E
Action RPG           A
MOBA                 T
Strategy             E
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         1 Maple Story
Adventure RPG         10-OCT-23 iOS

         2 League of Legends
MOBA                  10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter           10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         4 TeamFight Tactics
Strategy              10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC
```

During:

Statistics

Enter Rating: [T]   [Games with Specified Rating]

[Game that All Users Play]

[Highest average single player game difficulty for all Genres]

[Average genre difficulty for single player games]

[Show the number of genres available]

Statistics

Enter Rating: [T]   [Games with Specified Rating]   **League of Legends** **Valorant**
MOBA **FPS Shooter**

[Game that All Users Play]

[Highest average single player game difficulty for all Genres]

[Average genre difficulty for single player games]

[Show the number of genres available]

After: Unchanged Relations
    Genre (<u>genre</u>, ageRestriction)

```
GENRE                 AGERESTRICTION
-------------------- --------------------
FPS Shooter          T
Adventure RPG        E
Action RPG           A
MOBA                 T
Strategy             E
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        1 Maple Story
Adventure RPG        10-OCT-23 iOS

        2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC
```

AGGREGATION - GROUP BY
File: appService.js
Line: 360

Before: Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        1 Maple Story
Adventure RPG        10-OCT-23 iOS

        2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC
```

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

        8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

        9 Cyberpunk 2077
Action RPG           10-OCT-23 PC


    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
       10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation
```
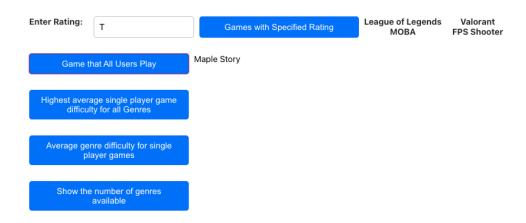
During:

Statistics

Enter Rating: [T]   **Games with Specified Rating**   **League of Legends**   **Valorant**
                                                        MOBA   **FPS Shooter**

Game that All Users Play   Maple Story

Highest average single player game difficulty for all Genres

Average genre difficulty for single player games

Show the number of genres available

After: Unchanged Relations
Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
         1 Maple Story
Adventure RPG         10-OCT-23 iOS

         2 League of Legends
MOBA                  10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter           10-OCT-23 Microsoft Windows

    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
         4 TeamFight Tactics
Strategy              10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC
```

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG            10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG         10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG            10-OCT-23 PC

    GAMEID TITLE
---------- --------------------------------------------------
GENRE               RELEASEDA PLATFORM
------------------- --------- --------------------
        10 Red Dead Redemption 2
Action RPG            10-OCT-23 PlayStation
```

AGGREGATION - HAVING
File: appService.js
Line: 180

Before:
SinglePlayerGame (**gameID**, difficulty)

```
    GAMEID DIFFICULTY
---------- ----------
         6          6
         7          8
         8         10
         9          9
        10          3
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         1 Maple Story
Adventure RPG         10-OCT-23 iOS

         2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows

    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC
```

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG           10-OCT-23 PC

    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation
```
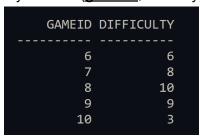
During: Unchanged Relations

Statistics

| Enter Rating: | T | | Games with Specified Rating | League of Legends MOBA | Valorant FPS Shooter |

| Game that All Users Play | Maple Story |

| Highest average single player game difficulty for all Genres | 8 |

| Average genre difficulty for single player games | Adventure RPG 8 | Action RPG 6.666666666666667 |

| Show the number of genres available |

After: Unchanged Relations
SinglePlayerGame (**gameID**, difficulty)

```
    GAMEID DIFFICULTY
---------- ----------
         6          6
         7          8
         8         10
         9          9
        10          3
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- ------------------------------------------------
GENRE              RELEASEDA PLATFORM
------------------ --------- --------------------
         1 Maple Story
Adventure RPG      10-OCT-23 iOS

         2 League of Legends
MOBA               10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter        10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- ------------------------------------------------
GENRE              RELEASEDA PLATFORM
------------------ --------- --------------------
         4 TeamFight Tactics
Strategy           10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG      10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG      10-OCT-23 PC
```

```
      GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG           10-OCT-23 PC


      GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation
```

NESTED AGGREGATION

File: appService.js

Line: 193

Before: SinglePlayerGame (**gameID**, difficulty)

```
      GAMEID DIFFICULTY
---------- ----------
         6          6
         7          8
         8         10
         9          9
        10          3
```

Game (gameID, title, **genre**, releaseDate, platform)

```
      GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         1 Maple Story
Adventure RPG        10-OCT-23 iOS

         2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


      GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC
```

```
    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- -------------------
         7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG        10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG           10-OCT-23 PC


    GAMEID TITLE
---------- ------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- -------------------
        10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation
```
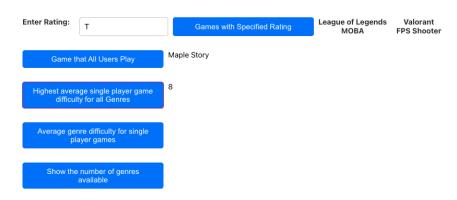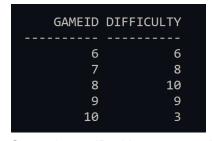
During:

Statistics

| Enter Rating: | T | Games with Specified Rating | League of Legends MOBA | Valorant FPS Shooter |

| Game that All Users Play | Maple Story |

| Highest average single player game difficulty for all Genres | 8 |

| Average genre difficulty for single player games |

| Show the number of genres available |

After: Unchanged Relations
SinglePlayerGame (**gameID**, difficulty)

```
GAMEID DIFFICULTY
---------- ----------
         6          6
         7          8
         8         10
         9          9
        10          3
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         1 Maple Story
Adventure RPG         10-OCT-23 iOS

         2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

         3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows

    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

         5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

         6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC
```

```
    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
         7 Assassins Creed Valhalla
Action RPG           10-OCT-23 Xbox

         8 The Legend of Zelda: Breath of the Wild
Adventure RPG         10-OCT-23 Nintendo Switch

         9 Cyberpunk 2077
Action RPG           10-OCT-23 PC

    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        10 Red Dead Redemption 2
Action RPG           10-OCT-23 PlayStation
```

DIVISION
File: appService.js
Line: 392

Before:
Genre (genre, ageRestriction)

```
GENRE                AGERESTRICTION
-------------------- --------------------
FPS Shooter          T
Adventure RPG        E
Action RPG           A
MOBA                 T
Strategy             E
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        1 Maple Story
Adventure RPG         10-OCT-23 iOS

        2 League of Legends
MOBA                  10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter           10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- -------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- --------------------
        4 TeamFight Tactics
Strategy              10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG         10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG         10-OCT-23 PC
```

During:

Statistics

Enter Rating: `T` | Games with Specified Rating | League of Legends   Valorant
                                                      MOBA   FPS Shooter

| Game that All Users Play | Maple Story

| Highest average single player game difficulty for all Genres | 8

| Average genre difficulty for single player games |

| Show the number of genres available |

After: Unchanged Relations
       Genre (genre, ageRestriction)

```
GENRE                AGERESTRICTION
-------------------- --------------------
FPS Shooter          T
Adventure RPG        E
Action RPG           A
MOBA                 T
Strategy             E
```

Game (gameID, title, **genre**, releaseDate, platform)

```
    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- -------------------
        1 Maple Story
Adventure RPG        10-OCT-23 iOS

        2 League of Legends
MOBA                 10-OCT-23 Microsoft Windows

        3 Valorant
FPS Shooter          10-OCT-23 Microsoft Windows


    GAMEID TITLE
---------- --------------------------------------------------
GENRE                RELEASEDA PLATFORM
-------------------- --------- -------------------
        4 TeamFight Tactics
Strategy             10-OCT-23 Microsoft Windows

        5 Genshin Impact
Adventure RPG        10-OCT-23 Microsoft Windows

        6 The Witcher 3: Wild Hunt
Adventure RPG        10-OCT-23 PC
```
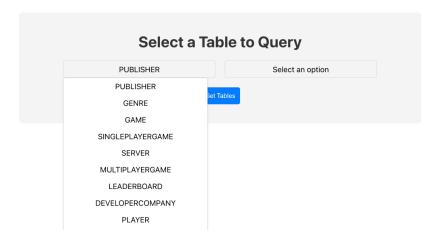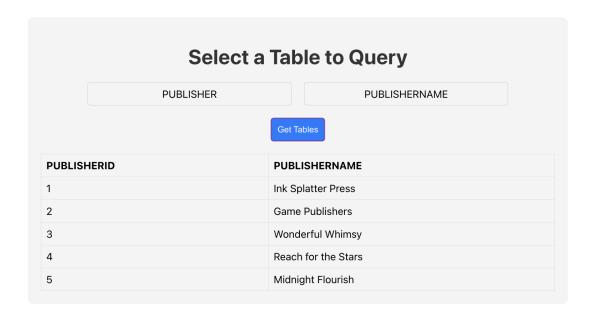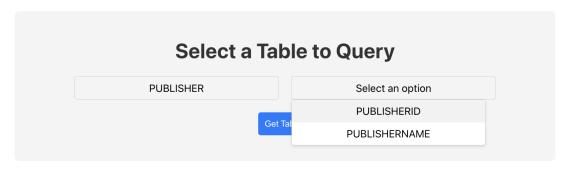
PROJECTION
File: appService.js
Line: 78 (table), 63 (attributes of table)
Before: Unchanged Relations
During: Unchanged Relations

Select a Table to Query

| Select an option | Select an option |

Get Tables

Select a Table to Query

PUBLISHER	Select an option

PUBLISHER

GENRE

GAME

SINGLEPLAYERGAME

SERVER

MULTIPLAYERGAME

LEADERBOARD

DEVELOPERCOMPANY

PLAYER

Get Tables

Select a Table to Query

PUBLISHER	PUBLISHERNAME

Get Tables

PUBLISHERID	PUBLISHERNAME
1	Ink Splatter Press
2	Game Publishers
3	Wonderful Whimsy
4	Reach for the Stars
5	Midnight Flourish

Select a Table to Query

PUBLISHER	Select an option
	PUBLISHERID
Get Tables	PUBLISHERNAME

Select a Table to Query

PUBLISHER	PUBLISHERNAME

Get Tables

PUBLISHERID	PUBLISHERNAME
1	Ink Splatter Press
2	Game Publishers
3	Wonderful Whimsy
4	Reach for the Stars
5	Midnight Flourish

After: Unchanged Relations