

Quick recall on project setting :

We created a database for a game based on a Call of duty model. Each player can have a solo game or a team mode. They can belong to a guild but it is not mandatory, and can add another player as a friend. They can use real money to buy coins and then use those coins to purchase items. The items are either weapons, armors or attachments that can be added to another item. Players have to organize their items in inventories so that they have them ready before the games.

Please run the main.py to test the options

```
/home/gabriel/gitrepos/Comp421-Project/env/bin/python /home/gabriel/gitrepos/Comp421-Project/main.py
Type q or Q at any time to exit the application.
Please pick a user from this list to play as
0) dimdim75
1) gabriel
2) gadu94zer
3) inesK22
4) jokazer
5) lyrink
6) mamounek
7) owen
8) pestoHu94
9) rebecca
10) rouDouBreh
11) yunus
12) zingalax
Enter a number from this list:
```

1. stored procedures

- Used when closing a game.
 - > `exp_requirements(level)` : it returns the experience required to level up (requirements increase as level increases)
 - > `close_game(gameId, winningTeam, endTime)` : it returns the leaderboard (a table) of the players in the game and their performance with the winning team members first. It updates the `game_sessions` table to "close the game" and the `players` table as needed with the experience earned/ level up.
- Used when purchasing an item with coins.
 - > `purchase_items(itemid, username)` : it returns the coin balance of the player after its purchase. It ensures that the user has enough coins, that he doesn't already possess this item and in the case this item is an attachment it checks he already owns the weapon the attachment goes onto.

2. User-friendly application

```
10) rouDouBreh
11) yunus
12) zingalax
Enter a number from this list: 1

Welcome back gabriel!

Please select something to do!
0) Simulate playing a game!
1) Create or modify an inventory to use in your games.
2) List personal statistics about previous games.
3) Join or create a guild.
4) Buy new items for use in games.
Enter a number from this list:
```

- Simulate game: It enables the user to play a game (he doesn't really play, it's just a simulation).

The game type and map will be a random choice between the existing possibilities. The player has to choose the inventory he wants to use, then the game can start. Using randomness during the game duration (20min) every players stats for this session (kills, deaths, assists) will be generated. The winning team will then be chosen based on those results and the statistics of our user for this session are calculated. Once the game is over, the entire leaderboard for this session is displayed (Rank, username, kills, deaths, assists, xp gain) and the level of the user is updated (could stay the same or increase) as well as the remaining experience points to level up. NB: it uses the closing game procedure.

4) Buy new items for use in games.
Enter a number from this list: 0

Simulating a game!

Team1	Team2
gabriel	jokazer
pestoHu94	dimdim75

Playing capture the flag on the map: Vimy Ridge

Select an inventory to bring into the game.

0) My First Inventory

Item Name	Type	Attachments in Use
grenade paralysante	melee	
M21 EBR	primary	
M19	sidearm	
Camouflage d hiver	Armor	

1) My Second Inventory

Item Name	Type	Attachments in Use
couteau sanglant	melee	
couteau - Pastiche	melee	
M21 EBR	primary	
Revolver 357	sidearm	

2) Loup

Item Name	Type	Attachments in Use
DL Q33 - Loup solitaire	primary	Lunette scopique - DL Q33, Viseur laser - DL Q33
couteau sanglant	melee	
Revolver 357	sidearm	
Camouflage d hiver	Armor	

3) NotInUse

Item Name	Type	Attachments in Use
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Enter a number from this list:

```

Enter a number from this list: 2

01:00) gabriel killed pestoHu94
01:57) jokazer killed dimdim75 with an assist from gabriel
02:42) dimdim75 killed jokazer
03:17) jokazer killed pestoHu94
03:53) gabriel killed pestoHu94
04:37) jokazer killed dimdim75 with an assist from gabriel
05:22) jokazer killed dimdim75
05:58) pestoHu94 killed gabriel
06:41) pestoHu94 killed gabriel with an assist from dimdim75
07:22) dimdim75 killed gabriel
08:09) jokazer killed pestoHu94 with an assist from gabriel
08:42) jokazer killed dimdim75
09:15) dimdim75 killed jokazer
09:52) dimdim75 killed jokazer with an assist from pestoHu94
10:38) pestoHu94 killed gabriel with an assist from dimdim75
11:24) jokazer killed dimdim75
12:09) gabriel killed pestoHu94
12:47) gabriel killed dimdim75 with an assist from jokazer
13:25) pestoHu94 killed gabriel with an assist from dimdim75
14:00) jokazer killed dimdim75
14:42) gabriel killed pestoHu94
15:10) pestoHu94 killed gabriel
15:38) dimdim75 killed gabriel
16:32) jokazer killed dimdim75
17:06) gabriel killed pestoHu94 with an assist from jokazer
17:47) pestoHu94 killed gabriel with an assist from dimdim75
18:29) dimdim75 killed jokazer
18:51) pestoHu94 killed gabriel
19:33) gabriel killed pestoHu94 with an assist from jokazer
20:00) Team 1 won the game!

```

if level up occurred :

```

Final leaderboard:
Team 1
  Rank  Player      Kills  Deaths  Assists  XP Gain
-----
    1  dimdim75      8       13       4       250
    2  inesK22       7        2       7       250

Team 2
  Rank  Player      Kills  Deaths  Assists  XP Gain
-----
    1  gadu94zer      9        9       2       100
    2  gabriel       6        6       7       100

Congratulations, you've leveled up to 53!
You have 89/7280 experience points to reach level 54

```

Else :

```
Final leaderboard:
```

Team 1					
Rank	Player	Kills	Deaths	Assists	XP Gain
1	jokazer	9	4	3	250
2	gabriel	7	9	3	250

Team 2					
Rank	Player	Kills	Deaths	Assists	XP Gain
1	pestoHu94	7	8	1	100
2	dimdim75	6	8	4	100

You gained 250 experience points, you now have 1709/7211 experience points required to reach level 53

- Inventory create : This option has itself 3 different options : the user can either rename an existing inventory, or modify the content of an existing inventory or create a new one. It checks if the name of the new/modified inventory is not already taken by another of its inventory. It lets the user add 1 of each type from primary, sidearm and melee for weapons each and 1 armor from its items owned. The user cannot add more items to an inventory so it needs to first remove one before modifying it. Then if wanted the player can add attachments to the items he/she has selected for their inventory.

```
4) Buy new items for use in games.
Enter a number from this list: 1

Creating an inventory!
What would you like to do? Please choose an option from this list.
0) Modify My First Inventory
1) Rename My First Inventory
2) Modify My Second Inventory
3) Rename My Second Inventory
4) Modify Loup
5) Rename Loup
6) Modify NotInUse
7) Rename NotInUse
8) Create a new inventory
Enter a number from this list:
```

Create a new inventory :

```
5) Rename My First Inventory
6) Modify Something Else
7) Rename Something Else
8) Create a new inventory
Enter a number from this list: 8

Please choose a name for your new inventory!
Please choose a name:
```


Please choose a name for your new inventory!

Please choose a name: *Abyssal*

Abyssal

Item Name	Type	Attachments in Use
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What would you like to do to this inventory?

Please choose an option from this list.

0) Add a weapon or armor

1) Remove a weapon or armor

2) Modify attachments for a weapon

3) Finish modifying, go back to main menu.

Enter a number from this list:

Add a weapon

0) Add a weapon or armor

1) Remove a weapon or armor

2) Modify attachments for a weapon

3) Finish modifying, go back to main menu.

Enter a number from this list: *0*

Please select an item from this list to add to your inventory

0) DL Q33 - Loup solitaire -- primary, weight: 55, range: 95, damage: 90

1) S36 - Requin abyssal -- primary, weight: 60, range: 46, damage: 75

2) HG 40 - hallow -- primary, weight: 25, range: 42, damage: 75

3) couteau sanglant -- melee, weight: 10, range: 10, damage: 50

4) grenade paralysante -- melee, weight: 3, range: 60, damage: 0

5) type 25 - Tropiques -- primary, weight: 40, range: 35, damage: 55

6) M21 EBR - Tropiques -- primary, weight: 55, range: 95, damage: 80

7) couteau - Pastiche -- melee, weight: 10, range: 10, damage: 30

8) grenade fumigène - vague bleue -- melee, weight: 3, range: 65, damage: 0

9) AK-47 -- primary, weight: 40, range: 66, damage: 70

10) M21 EBR -- primary, weight: 55, range: 95, damage: 80

11) M4LMG - Triangle rouge -- primary, weight: 60, range: 45, damage: 60

12) POW-57 - Gene zombie -- primary, weight: 25, range: 25, damage: 90

13) RPD -- primary, weight: 60, range: 50, damage: 65

14) BY15 -- primary, weight: 25, range: 30, damage: 85

15) MW11 -- sidearm, weight: 10, range: 20, damage: 55

16) M19 -- sidearm, weight: 10, range: 20, damage: 35

17) 1911 -- sidearm, weight: 10, range: 35, damage: 45

18) Revolver 357 -- sidearm, weight: 30, range: 40, damage: 70

19) X16 -- sidearm, weight: 10, range: 10, damage: 50

20) Firebreak -- Armor, weight: 45, protection: 55

21) Uniforme Mante -- Armor, weight: 55, protection: 60

22) Camouflage d hiver -- Armor, weight: 20, protection: 32

23) Forces spéciales 1 -- Armor, weight: 30, protection: 10

24) Forces spéciales 2 -- Armor, weight: 30, protection: 10

25) Eclaireur -- Armor, weight: 20, protection: 10

Enter a number from this list:

modify attachments

```
Please choose an option from this list:  
0) Add a weapon or armor  
1) Remove a weapon or armor  
2) Modify attachments for a weapon  
3) Finish modifying, go back to main menu.  
Enter a number from this list: 2  
  
Which weapon would you like to modify attachments for?  
Choose a weapon from this list:  
0) S36 - Requin abyssal  
1) couteau - Pastiche  
2) MW11  
Enter a number from this list: 0
```

```
Choose a weapon from this list:  
0) S36 - Requin abyssal  
1) couteau - Pastiche  
2) MW11  
Enter a number from this list: 0  
  
What would you like to do?  
Please select a number from this list:  
0) Add a new attachment  
1) Exit to previous menu.  
Enter a number from this list: 0
```

Add attachment

```
What would you like to do?  
Please select a number from this list:  
0) Add a new attachment  
1) Exit to previous menu.  
Enter a number from this list: 0  
  
Which attachment would you like to add.  
Choose a number from this list:  
0) Silencieux - S36, weight: 7  
1) Poignée avant - S36, weight: 3
```

Or remove attachment

```
What would you like to do?  
Please select a number from this list:  
0) Add a new attachment  
1) Remove an attachment  
2) Exit to previous menu.  
Enter a number from this list: 1
```

Rename an inventory

```
Creating an inventory!
What would you like to do? Please choose an option from this list.
0) Modify My Second Inventory
1) Rename My Second Inventory
2) Modify Loup
3) Rename Loup
4) Modify NotInUse
5) Rename NotInUse
6) Modify My First Inventory
7) Rename My First Inventory
8) Create a new inventory
Enter a number from this list: 1

What would you like to rename My Second Inventory to?
Please choose a name:
```

```
What would you like to rename My Second Inventory to?
Please choose a name: Something Else
Inventory renamed successfully!
```

- List player stats : It displays some statistics of the user based on all their game sessions. It displays their overall number of games played, kill-death ratio, winrate and also displays these stats by the inventory that they use. Additionally it shows the results of their previous 5 games.

```
4) Buy new items for use in games.
Enter a number from this list: 2

gabriel --- level: 53, experience: 89/7280
You've played 47 games so far.
You've won 36 games for a win rate of 0.77
Your average kill to death ratio (KDR) is 2.04

Here are some stats about your inventories
Inventory Name      KDR    winrate    Games Played
-----
My First Inventory   27      1.93      0.78
My Second Inventory  16      2.35      0.75
Loup                 3       1.76      1
NotInUse             1       1         0

Here are your most recent games
Start Time          Outcome   Game Type      Map           Kills   Deaths   Assists   KDR   Duration
-----
2020-04-10 16:22:58 Win       search-and-destroy Verdun        12      6        2      2    20 minutes
2020-04-11 10:14:21 Win       capture-the-flag  Rust         11      4        5      2.75 20 minutes
2020-04-11 10:14:31 Win       search-and-destroy Verdun        11      2        5      5.5   20 minutes
2020-04-12 16:38:55 Win       capture-the-flag  Vimy Ridge   7       9        3      0.78 20 minutes
2020-04-12 16:40:55 Loss      team-deathmatch  Vimy Ridge   6       6        7       1    20 minutes
```


- Create or Join a Guild: This menu does the following:
 - If the player is already in the guild it gives them the option to leave or stay in the guild (a player may only be in zero or one guilds). If the player is the admin of that guild then they must choose another player to become the new admin before leaving, and if they're the only member then the guild is deleted.
 - If the player is not in a guild, they get the option to join a guild or create a new guild. When creating a new guild we ensure that the name is not already taken by another guild, and once created the player becomes the admin of that guild.

Create a guild

```

What would you like to do?
0) Join a guild
1) Create a new guild
2) Exit back to main menu
Enter a number from this list: 1

Creating a guild
Please choose a name for your guild
Please choose a name:

```

```

Creating a guild
Please choose a name for your guild
Please choose a name: The Storm

```

Verify you are not in a guild before joining another one

```

1) Create or modify an inventory to use in your games.
2) List personal statistics about previous games.
3) Join or create a guild.
4) Buy new items for use in games.
Enter a number from this list: 3

These are your fellow guild members:
mamounek

You've been a member of 7empest since 2020-04-12
If you want to join/create another guild you must leave first.
Would you like to leave the guild? Enter y or Y to leave, and enter anything else to continue
Input:

```

Confirm that if you leave a guild while being the administrator and alone in it then it will destroy it

```

You've been a member of The Storm since 2020-04-12
If you want to join/create another guild you must leave first.
Would you like to leave the guild? Enter y or Y to leave, and enter anything else to continue
Input: y
Since you're the admin and the sole member of the guild, the guild will be deleted.
Confirm that this is what you want to do by entering y or Y:

```

If there is another member in the guild then you can name him/her administrator

```
You've been a member of 7empest since 2020-04-12
If you want to join/create another guild you must leave first.
Would you like to leave the guild? Enter y or Y to leave, and enter anything else to continue
Input: y
Since you're the admin you should assign a new admin first before leaving.
Who would you like to make the admin?
0) gabriel
Enter a number from this list:
```

Join a guild

```
Enter a number from this list: 0

Which guild would you like to join?
0) Abandoned Helix -- Admin: yunus, active since 2020-02-28
1) Hallowed Apocalypse -- Admin: owen, active since 2020-02-28
2) Honored Admirals -- Admin: rebecca, active since 2020-02-28
3) Tempest Noobs -- Admin: dimdim75, active since 2020-02-28
4) 7empest -- Admin: mamounek, active since 2020-04-12
5) Exit without joining anything
Enter a number from this list:
```

- Marketplace : As the name implies, it's a place where the player can buy new items with their coins. if the transaction has been successful then the item is added to the user's owned items. NB: it uses the purchase item procedure.

```
3) Join or create a guild.
4) Buy new items for use in games.
Enter a number from this list: 4

You have 13200 coins in your balance
What would you like to do?
0) Browse weapons
1) Browse armors
2) Browse attachments for your weapons
3) Exit the marketplace
Enter a number from this list:
```

Buy an armor

```
Your balance is now 10800
What would you like to purchase? You may exit without purchasing anything.
0) Price: 700 -- Firebreak -- weight: 45, protection: 55
1) Price: 800 -- Uniforme Mante -- weight: 55, protection: 60
2) Price: 400 -- Camouflage d hiver -- weight: 20, protection: 32
3) Price: 100 -- Forces spéciales 1 -- weight: 30, protection: 10
4) Price: 100 -- Forces spéciales 2 -- weight: 30, protection: 10
5) Price: 150 -- Eclaireur -- weight: 20, protection: 10
6) Exit
Enter a number from this list:
```

```
6) Exit
Enter a number from this list: 0

You now own Firebreak
Your balance is now 10100
What would you like to purchase? You may exit without purchasing anything.
0) Price: 800 -- Uniforme Mante -- weight: 55, protection: 60
1) Price: 400 -- Camouflage d hiver -- weight: 20, protection: 32
2) Price: 100 -- Forces spéciales 1 -- weight: 30, protection: 10
3) Price: 100 -- Forces spéciales 2 -- weight: 30, protection: 10
4) Price: 150 -- Eclaireur -- weight: 20, protection: 10
5) Exit
Enter a number from this list:
```

Buy a weapon

```
Your balance is now 13200
What would you like to purchase? You may exit without purchasing anything.
0) Price: 1600 -- S36 - Requin abyssal -- weight: 60, range: 46, damage: 75
1) Price: 1600 -- HG 40 - hallow -- weight: 25, range: 42, damage: 75
2) Price: 560 -- couteau sanglant -- weight: 10, range: 10, damage: 50
3) Price: 350 -- grenade paralysante -- weight: 3, range: 60, damage: 0
4) Price: 800 -- type 25 - Tropiques -- weight: 40, range: 35, damage: 55
5) Price: 800 -- M21 EBR - Tropiques -- weight: 55, range: 95, damage: 80
6) Price: 500 -- AK-47 -- weight: 40, range: 66, damage: 70
7) Price: 700 -- M21 EBR -- weight: 55, range: 95, damage: 80
8) Price: 550 -- M4LMG - Triangle rouge -- weight: 60, range: 45, damage: 60
9) Price: 700 -- BY15 -- weight: 25, range: 30, damage: 85
10) Price: 390 -- M19 -- weight: 10, range: 20, damage: 35
11) Price: 500 -- Revolver 357 -- weight: 30, range: 40, damage: 70
12) Price: 400 -- X16 -- weight: 10, range: 10, damage: 50
13) Exit
Enter a number from this list:
```



```

Your balance is now 13200
What would you like to purchase? You may exit without purchasing anything.
0) Price: 1600 -- S36 - Requin abyssal -- weight: 60, range: 46, damage: 75
1) Price: 1600 -- HG 40 - hallow -- weight: 25, range: 42, damage: 75
2) Price: 560 -- couteau sanglant -- weight: 10, range: 10, damage: 50
3) Price: 350 -- grenade paralysante -- weight: 3, range: 60, damage: 0
4) Price: 800 -- type 25 - Tropiques -- weight: 40, range: 35, damage: 55
5) Price: 800 -- M21 EBR - Tropiques -- weight: 55, range: 95, damage: 80
6) Price: 500 -- AK-47 -- weight: 40, range: 66, damage: 70
7) Price: 700 -- M21 EBR -- weight: 55, range: 95, damage: 80
8) Price: 550 -- M4LMG - Triangle rouge -- weight: 60, range: 45, damage: 60
9) Price: 700 -- BY15 -- weight: 25, range: 30, damage: 85
10) Price: 390 -- M19 -- weight: 10, range: 20, damage: 35
11) Price: 500 -- Revolver 357 -- weight: 30, range: 40, damage: 70
12) Price: 400 -- X16 -- weight: 10, range: 10, damage: 50
13) Exit
Enter a number from this list:

```

Buy an attachment

```

Your balance is now 10100
What would you like to purchase? You may exit without purchasing anything.
0) Price: 600 -- For: DL Q33 - Loup solitaire -- Lunette scopique - DL Q33 -- weight: 0
1) Price: 120 -- For: Firebreak -- Sac à dos - Firebreak -- weight: 10
2) Price: 550 -- For: S36 - Requin abyssal -- Silencieux - S36 -- weight: 7
3) Price: 350 -- For: S36 - Requin abyssal -- Poignée avant - S36 -- weight: 3
4) Exit
Enter a number from this list:

```

```

4) Exit
Enter a number from this list: 2

You now own Silencieux - S36
Your balance is now 9550
What would you like to purchase? You may exit without purchasing anything.
0) Price: 600 -- For: DL Q33 - Loup solitaire -- Lunette scopique - DL Q33 -- weight: 0
1) Price: 120 -- For: Firebreak -- Sac à dos - Firebreak -- weight: 10
2) Price: 350 -- For: S36 - Requin abyssal -- Poignée avant - S36 -- weight: 3
3) Exit
Enter a number from this list:

```

3. Two indexes to speed up our queries (not based on primary keys or unique constraints)

- We created an index on the `guild_name` attribute in the `players` relation. The objective is to speed up queries which fetch the members of a guild, a feature that we use in our application. If you think about scaling this feature to support a game with many guilds with a large number of users, this index is essential.

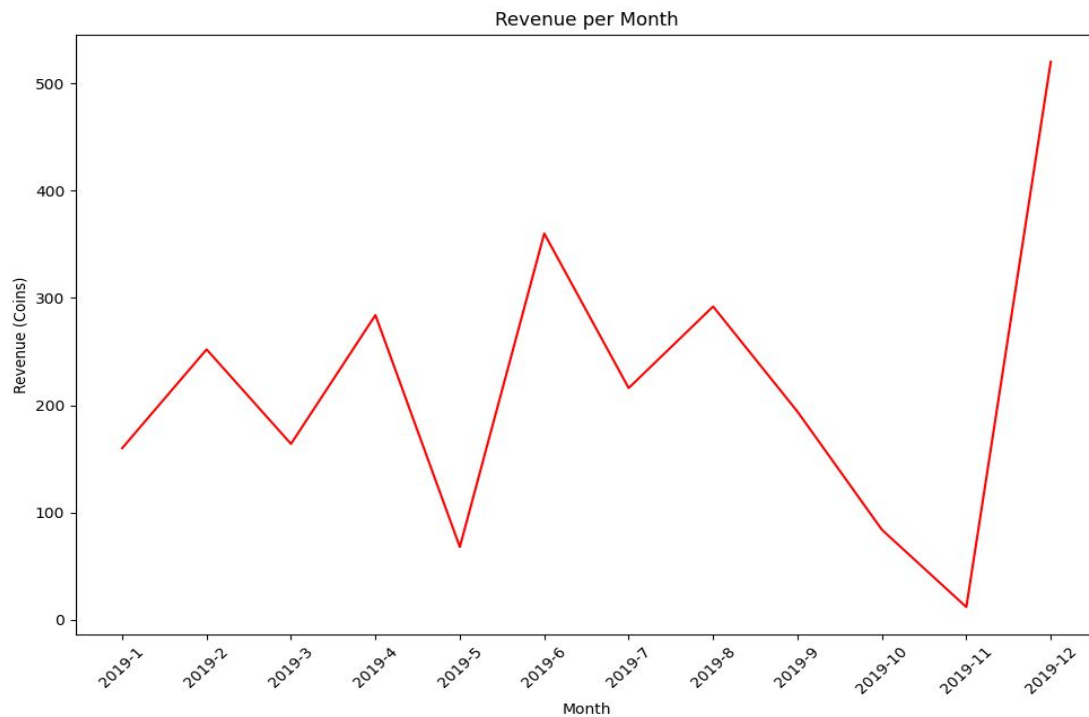
- Additionally we created a clustered index on the gid attribute of the plays relation. The primary key of this relation is the triplet of (username, inventory_name, gid) so for queries which filter only by gid this index serves no value. In the “close_game” stored procedure we fetch all the players that played in a particular game session, and this is a common use case in other settings as well. We also often join the game sessions table to the plays table on the GID. Since each gid would have at most 10 tuples in the table, it’s definitely beneficial to use this index for joins since this table might grow to millions of tuples, and thus the cardinality reduction of gid=? is incredibly high. It’s also natural to cluster the table based on gid, since new tuples are added to the table in increasing order of gid as new games are played. Therefore reclustering the table will be relatively cheap.

As a bonus we also made two additional indexes for possible future queries that aren’t included in our application code:

- An index on the level of the users. As game sessions prefer to match players that are close in level it will help in real life the game session to pick players with the same level.
- A index on the price of items. Since a player cannot buy an item he doesn’t have the necessary coins for, in real life if he wants, it would be useful to only display him the items he can possibly buy.

4. 2 charts to visualize important aspects

- The graph shows the revenue per month made by the application throughout 2019. We notice that people tend to buy more coins during summer, as well as around Christmas. We can almost certainly conclude that this is due to children being away from school over the holidays.



- Social graph: It shows the friends relation between users to see who is making the link between different groups. In real life it could have a use for advertisement companies.

