Building a Discord Game with Postgres

Agenda

- About us
- Motivation behind the Project
- Tools we used
- How our game works
- What we experienced & learned
- Conclusion
- Demonstration

About us

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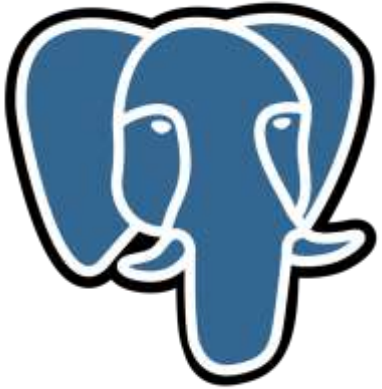
working student in Data Analytics

Motivation behind the project

- originally a Uni-Project for the *Databases Class*
- what was needed was an ERD (Entity-Relationship-Diagram) and to build the database schema and show some sample SQL-queries
- shared interest in gaming
- personal interest in developing games

- so we build a text based RPG (Role Play Game) with basic functionality
  - player combat
  - item gathering

PostgreSQL



- it was given as the database system of choice by the university

I also asked our Professor why they decided to use PostgreSQL

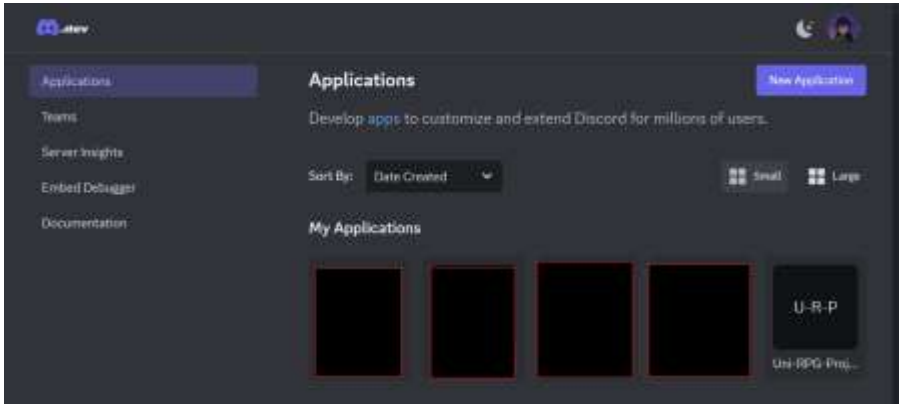
- Broadly used; many use cases thus nice to have for students
- Open Source, no licensing fees
- Can be easily hosted on campus

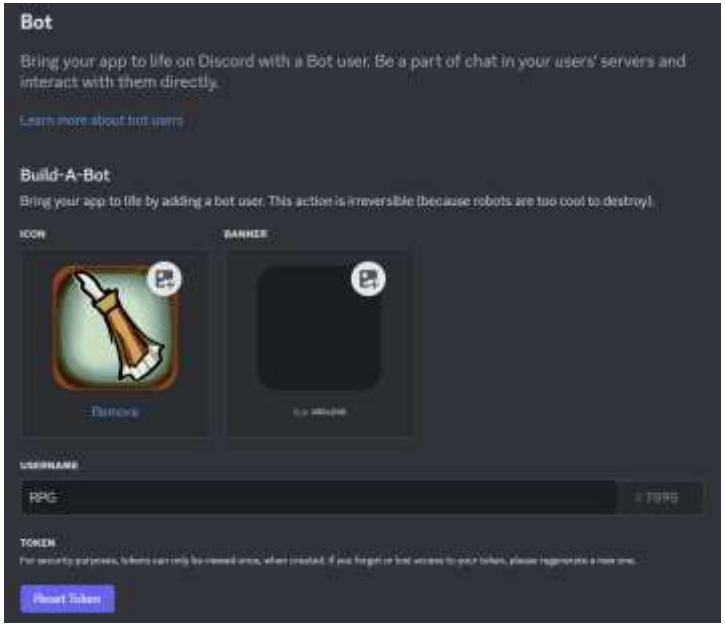
However the University Server has reached EOL

	version text
1	PostgreSQL 12.18 (Debian 12.18-1.pgdg110+2) on x86_64-pc-linux-gnu, compiled by gcc (Debian 10.2.1-6) 10.2.1 20210110, 6...

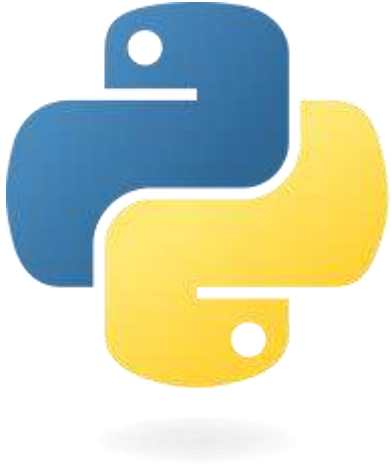
Discord

- easy to use developer portal
- “free” hosting
- “build-in” multiplayer support





Python

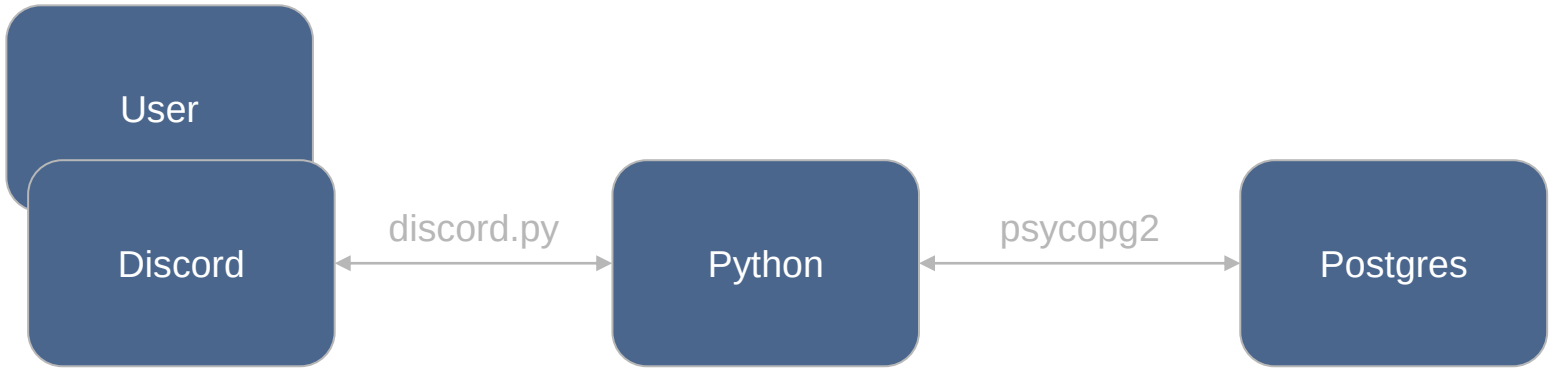


- the programming language most are familiar with
- easy to work with
- nice package library, we used psycopg2 and discord.py

Why psycopg2?

At the start of the project we googled how to connect yourself to the database with python - psycopg2 was recommended the most, so we used it. We know there it the more modern psycopg3 but it was to bothersome to change it :)

API Integrations

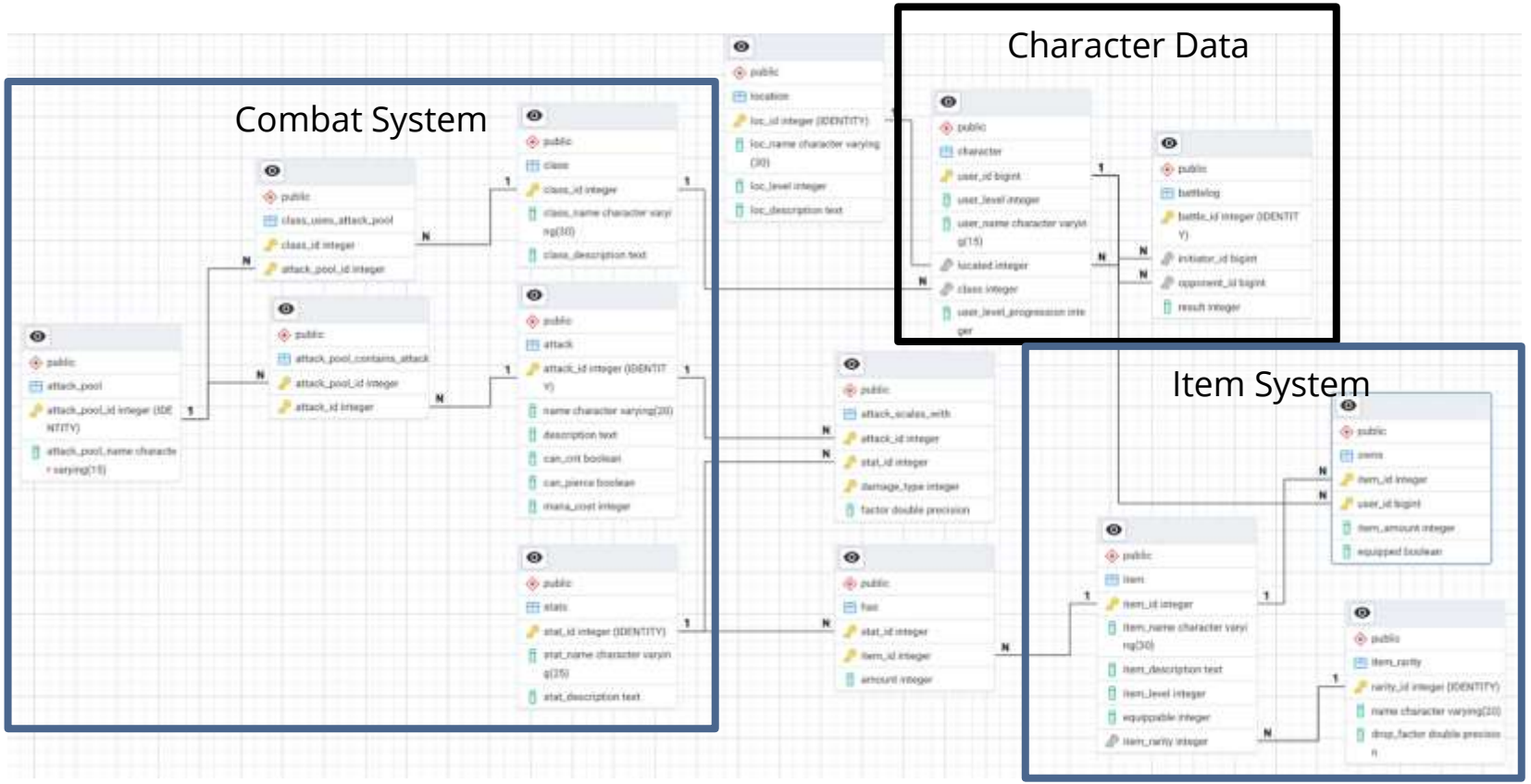


- Handles UI/IO

- Handles Game Logic
- Handles API connections

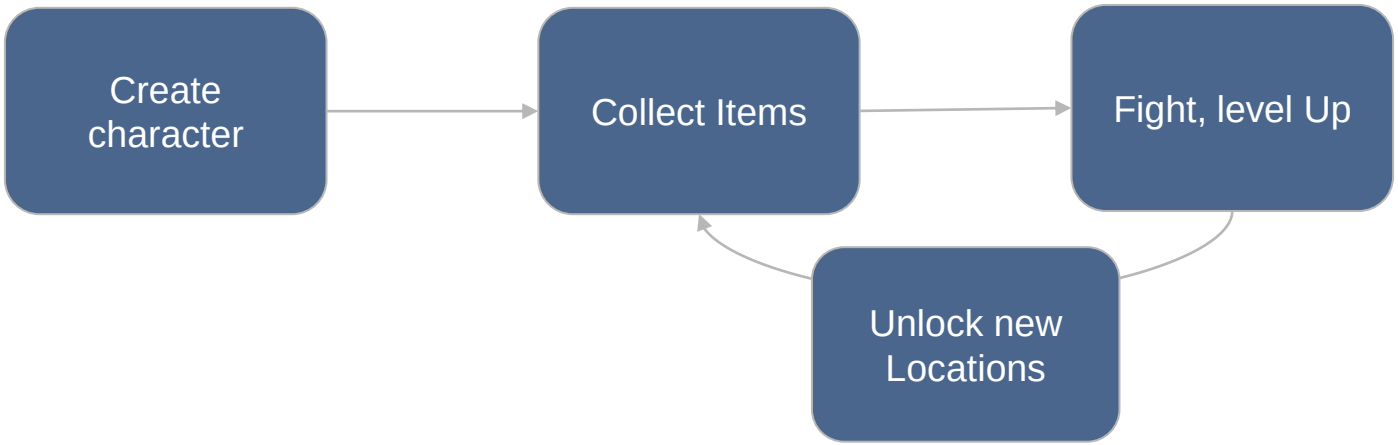
- Manages Gamedata

Database Schema

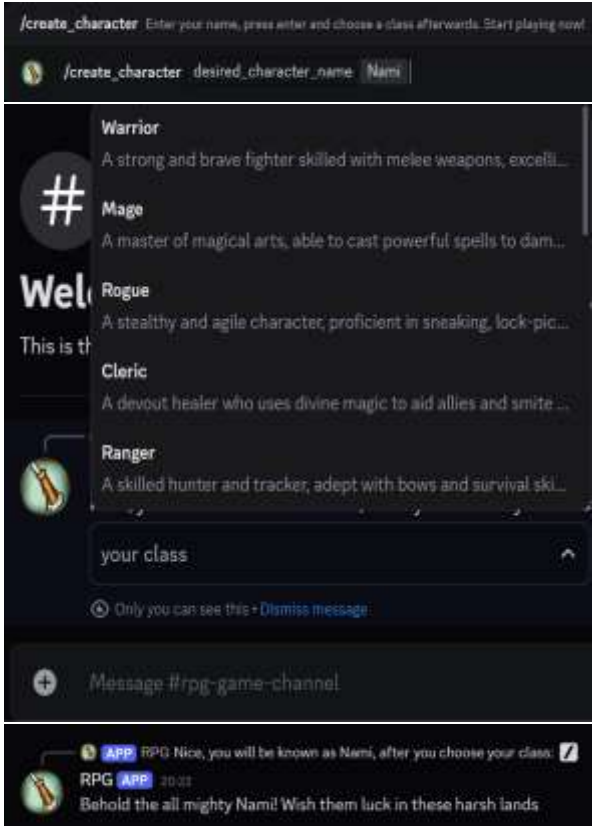


Gameplay

Basic Gameplay loop



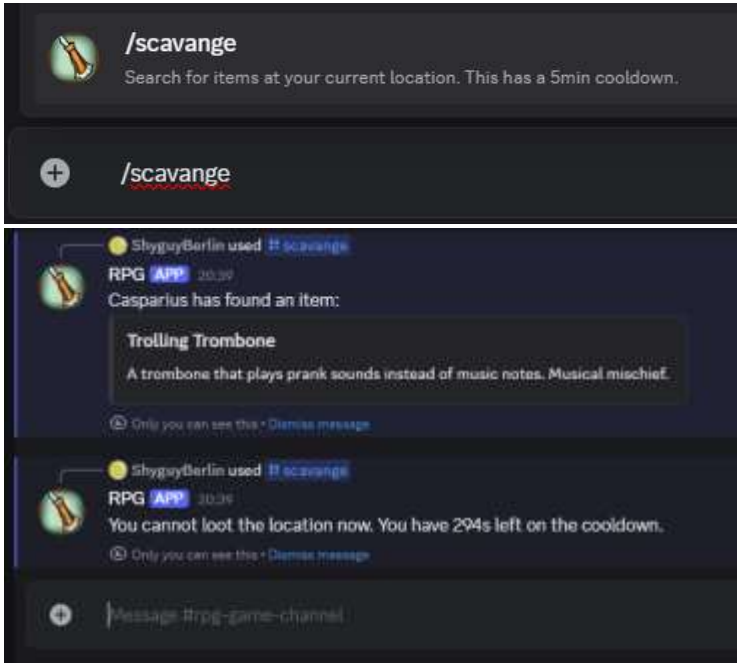
Gameplay - Character Creation




```python
classes=[]
sheet=class_choice_view()
sheet.character_class.plugin=self
sheet.character_class.options=[]
#char_class = ui.Select(placeholder="Your Class",options=[])
#Getting Character Classes

if self.db_cur:
    self.db_cur.execute("SELECT c.class_id,c.class_name,c.class_description FROM class c")
    classes=self.db_cur.fetchall()
for i in classes:
    sheet.character_class.append_option(discord.SelectOption(label=i[1],description=shorten_description(i[2]),value=i[0]))

sheet.add_item(sheet.character_class)

# Save name for later use
data = load_json()
if not "open_creation_prompts" in data:
    data["open_creation_prompts"]={}
data["open_creation_prompts"][str(ctx.user.id)]=desired_character_name
dump_json(data)


await ctx.response.send_message(f"Nice, you will be known as {desired_character_name}, after you choose your class:",view=sheet,ephemeral=True)
```

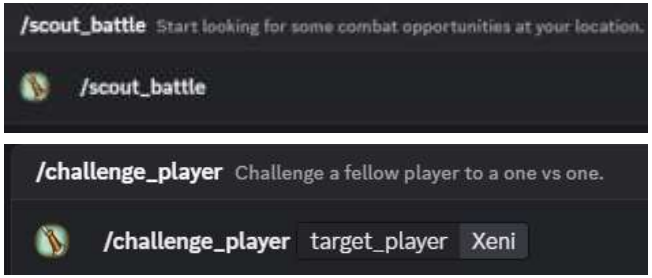
```python
data = load_json()
if "open_creation_prompts" in data:
    if str(interaction.user.id) in data["open_creation_prompts"]:
        name = data["open_creation_prompts"][str(interaction.user.id)]
        del data["open_creation_prompts"][str(interaction.user.id)]
        dump_json(data)
        self.plugin.db_cur.execute(f"INSERT INTO character VALUES (%s,1,%s,0,%s)",(str(interaction.user.id),name,int(interaction.data['values'][0])))
        self.plugin.db.commit()
        weird_announcements=["They are still young, but will conquer the world sooner or later.","Keep an eye on them or they will throw you from your
        await interaction.response.send_message(f"Behold the all mighty {name}! "+weird_announcements[random.randint(0,len(weird_announcements)-1)])
else:
    await interaction.response.send_message("Something went wrong. Maybe refer to an admin if it happens again.")
```

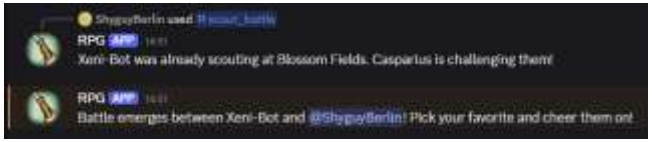
Gameplay - Item Gathering

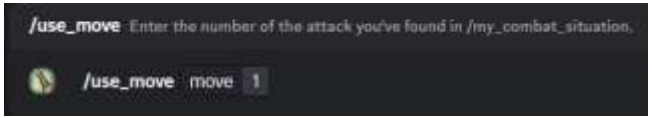


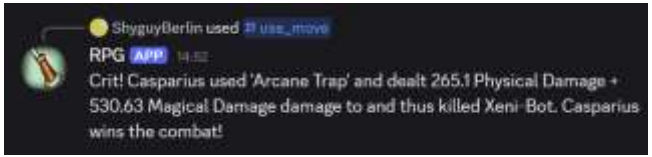

```
if self.db_cur:
    self.db_cur.execute(f"SELECT * FROM valid_item_pools WHERE user_id=%s",(ctx.user.id,))
    db_item_pool=self.db_cur.fetchall()
    for i in range(len(db_item_pool)):
        level_weights=[0.4,0.7,1,0.2]
        print(db_item_pool[i])
        item_pool.append([i,level_weights[min(3,max(0,db_item_pool[i][6]+2))]*db_item_pool[i][5]])
    summed_weight=sum([x[1] for x in item_pool])
    rand_choice=random.random()*summed_weight
    chosen=None
    for i in range(len(item_pool)):
        if rand_choice<item_pool[i][1]:
            chosen=db_item_pool[item_pool[i][0]]
            break
        rand_choice-=item_pool[i][1]
    if chosen:
        print(chosen)
        #The selected item is already present in the players inventory
        if chosen[7]!=None:
            self.db_cur.execute(f"UPDATE owns SET item_amount=%s WHERE item_id=%s and user_id=%s;",(chosen[7]+1,chosen[2],chosen[0]))
            self.db.commit()
        #The selected item is new to this player
        else:
            self.db_cur.execute(f"INSERT INTO owns VALUES (%s,%s,%s,%s);",(chosen[2],chosen[0],1,False))
            self.db.commit()

        item_embed=discord.Embed(title=chosen[3],description=chosen[8])

        await ctx.response.send_message(f"{chosen[1]} has found an item:",embed=item_embed,ephemeral=True)
    else:
        await ctx.response.send_message(f"I, the bot, am not able to randomly select an item, sorry",ephemeral=True)
else:
    await ctx.response.send_message(f"I, the bot, am not able to connect to the database, sorry",ephemeral=True)
```

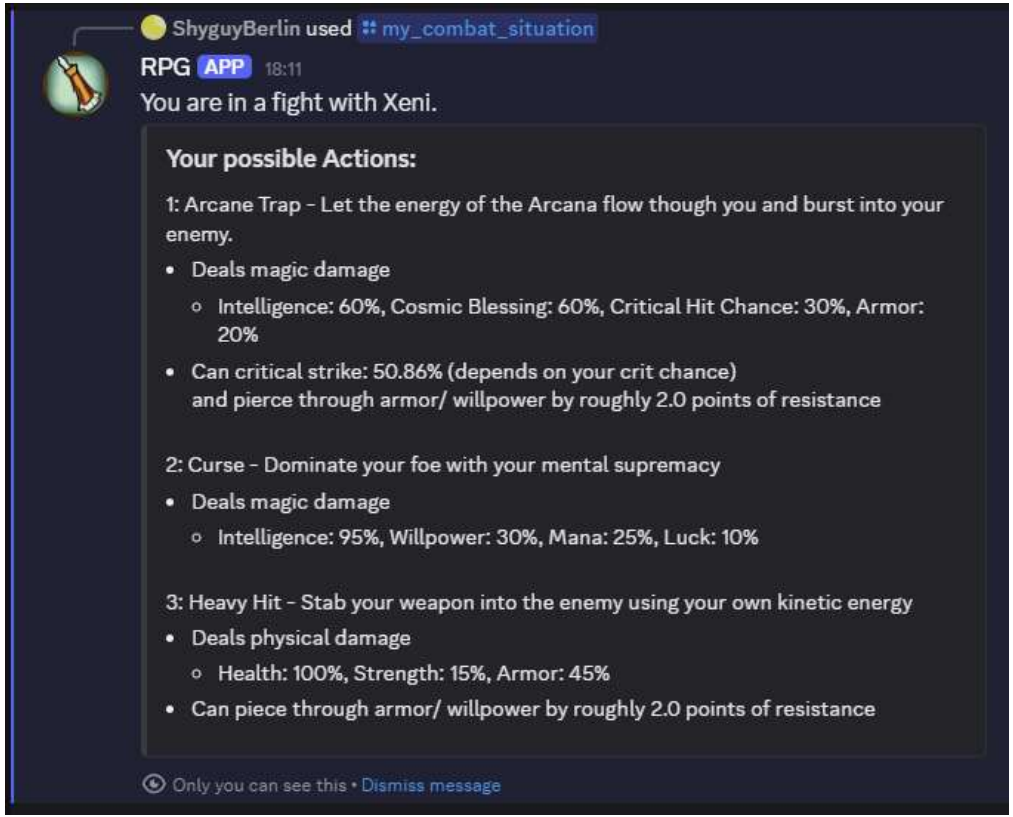
Gameplay - Combat System











Problems and Observations

pgAdmin 4

- beginner friendly
- easy way to create tables
- useful to get an overview of our database schema
- shows all options available to you

Console commands

- more advanced commands (like getting the database dump)

Problems and Observations

- Many available data types

```
                                Table "public.character"
       Column        |         Type          | Collation | Nullable | Default
---------------------+-----------------------+-----------+----------+---------
 user_id             | bigint                |           | not null |
 user_level          | integer               |           | not null | 1
 user_name           | character varying(15) |           | not null |
 located             | integer               |           | not null | 0
 class               | integer               |           | not null | 0
 user_level_progression | integer            |           | not null | 0
Indexes:
    "User_pkey" PRIMARY KEY, btree (user_id)
    "fki_user_loc_id_fkey" btree (located)
Foreign-key constraints:
    "user_class_id_fke" FOREIGN KEY (class) REFERENCES class(class_id)
    "user_loc_id_fkey" FOREIGN KEY (located) REFERENCES location(loc_id)
```

- Nullable fields or default values

```
                                  Table "public.attack"
   Column    |         Type          | Collation | Nullable |              Default
-------------+-----------------------+-----------+----------+-----------------------------------
 attack_id   | integer               |           | not null | generated by default as identity
 name        | character varying(20) |           |          |
 description | text                  |           |          |
 can_crit    | boolean               |           | not null | false
 can_pierce  | boolean               |           | not null | false
 mana_cost   | integer               |           |          |
Indexes:
    "attack_pkey" PRIMARY KEY, btree (attack_id)
```

Problems and Observations

- Read the docs!

- Secure queries

```
self.db_cur.execute(f"SELECT loc_id, loc_name FROM location WHERE loc_level<={player.level} and loc_name='{str(target_location)}'")
if self.db_cur.rowcount==0:
    await no_loc_found()
    return
loc=self.db_cur.fetchone()
```

```
self.db_cur.execute(f"SELECT loc_id, loc_name FROM location WHERE loc_level<=%s and loc_name=%s",(player.level,str(target_location)))
if self.db_cur.rowcount==0:
    await no_loc_found()
    return
loc=self.db_cur.fetchone()
```

Problems and Observations

- Privilege Management

```
                                   List of roles
   Role name    |                         Attributes                         | Member of | Description
----------------+------------------------------------------------------------+-----------+-------------
postgres        | Superuser, Create role, Create DB, Replication, Bypass RLS | {}        |
rpg_bot         |                                                            | {}        |
rpg_bot_testing |                                                            | {}        |
```

```
--
-- Name: TABLE "character"; Type: ACL; Schema: public; Owner: postgres
--

GRANT SELECT,INSERT,DELETE,UPDATE ON TABLE public."character" TO rpg_bot;
```

Conclusion

Overall: fun project to learn how to write a small application with databases

If you want to play around with the bot on discord: [QR/Link]

discord

you can also host it yourself, just follow the readme in the repository

- (https://github.com/xen1i/RPG_Project)

github

Demonstration + Questions