Updated Phase 1

1. Users and user stories

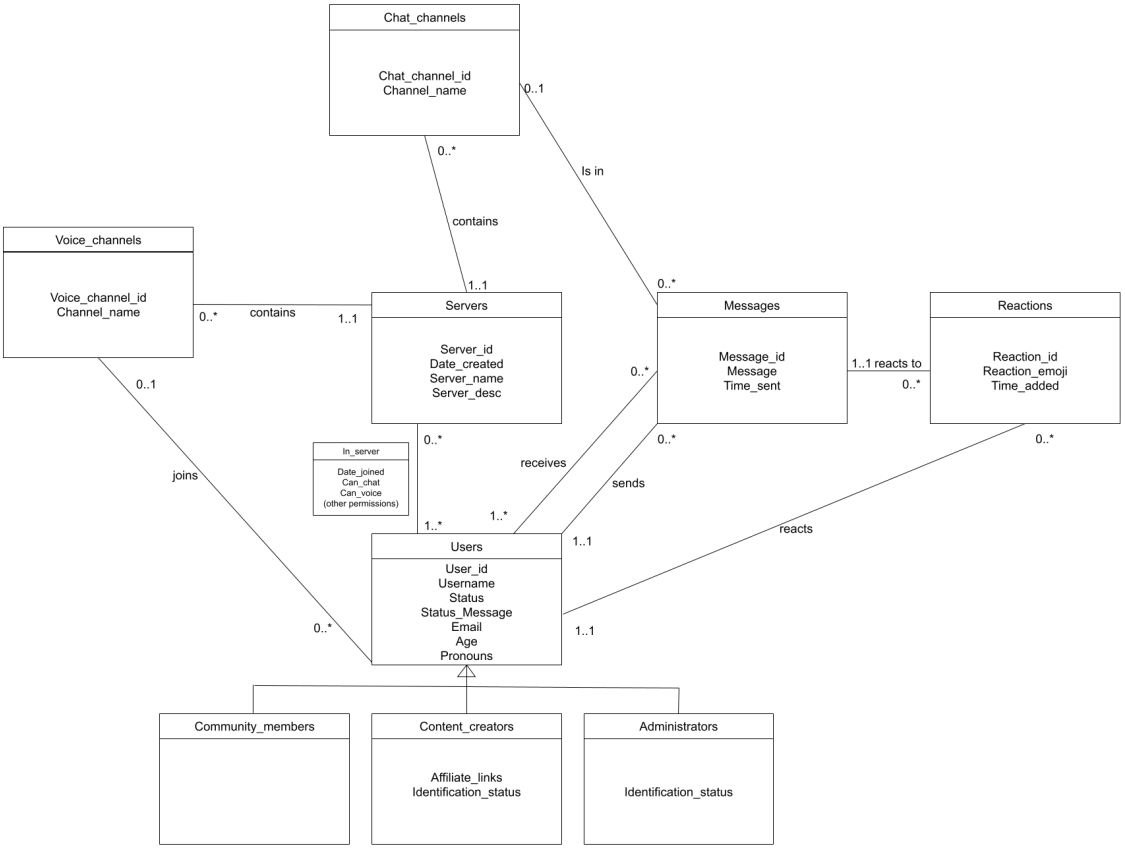
Users:

- Community member - a general user who is part of a specific community that has a server on the platform. E.g. a Minecraft video gamer in the official Minecraft community on the Minecraft server, a student in a high school basketball club on the club server.
- Content creators - a social media influencer who interacts with their own fanbase and audience on the platform. E.g. a YouTuber who makes content by reacting to videos sent from their viewers.
- Server administrators - a manager for a server on the platform. E.g. a teacher who is managing a Q&A forum on the platform.

ID	Verb + Noun	As a <role>	I want <goal>	So that <reason>	Simple / Complex	Operational / Analytical
US1	Search for a server	Community member	Search for servers	I can find community who share common interests	simple	Operational
US2	Join a voice channel	Community member	Join a voice channel	I can communicate with others in	simple	Operational

				the same community		
US3	Host a poll using reactions	Content creator	Host a poll using reactions	I can gauge interest in certain topics	simple	analytical
US4	Count new users within a period	Content creator	Count new users within a period	I can see how well my brand is flourishing	complex	analytical
US5	join a server	Community member	join servers	I can find community who share common interests	Simple	Operational
US6	Assign server permissions	Server administrator	Assign server permissions	The server settings cannot be modified by untrusted individuals	Complex	Operational
US7- trigger function	Delete account	Community member	Delete account	I can stop using Discord	Complex	Operational
US8	Send a direct message	Community member	Send a direct message	Communicate with peers in different time zones	complex	operational

US9 (new)	Count interactions	Community member	Count my interactions with each server (messages, reactions, voice calls)	I can gauge my activity with each community	complex	Analytical
US10 -window function	Rank users	administrator	Rank users based on number of messages sent in a server	I can analyze how active the members are	complex	analytical



Phase 2 Final Deliverable

3. Relational model

Servesr(Server_id, date_created, server_name, server_desc)
In_server(Server_id, User_id, date_joined, can_chat, can_voice)
Users(User_id, Username, Status, Status_message, Email, Age, Pronouns)
Community_members(User_id)
Content_creators(User_id, affiliate_link, identification_status)
Administrators(User_id, identification_status)T
Voice_channels(Voice_channel_id, Channel_name, Server_id)
In_voice_channel(Voice_channel_id, User_id)
Chat_channels(Chat_channel_id, Channel_name, server_id)
Messages(Message_id, message, time_sent, sender_id)
Reactions(reaction_id, reaction_emoji, time_added, message_id, user_id)
Channel_messages(message_id, chat_channel_id)
Dm_messages(message_id, receiver_id)

4. Functional Dependencies

All FDs satisfies BCNF

(a) Server_id -> date_created, server_name, server_desc
(b) User_id -> Username, Status, Status Message, Email, Age, Pronouns (for user)
(c) User_id -> affiliate_link, identification_status (for content creator)
(d) User_id -> identification_status (for administrator)
(e) Server_id, User_id, date_joined -> can_chat, can_voice
(f) Voice_channel_id -> channel_name (for voice channels), server_id
(g) Chat_channel_id -> channel_name (for chat channels) server_id
(h) Message_id -> message, time_sent, sender_id
(i) Reaction_id -> reaction_emoji, time_added, message_id, user_id

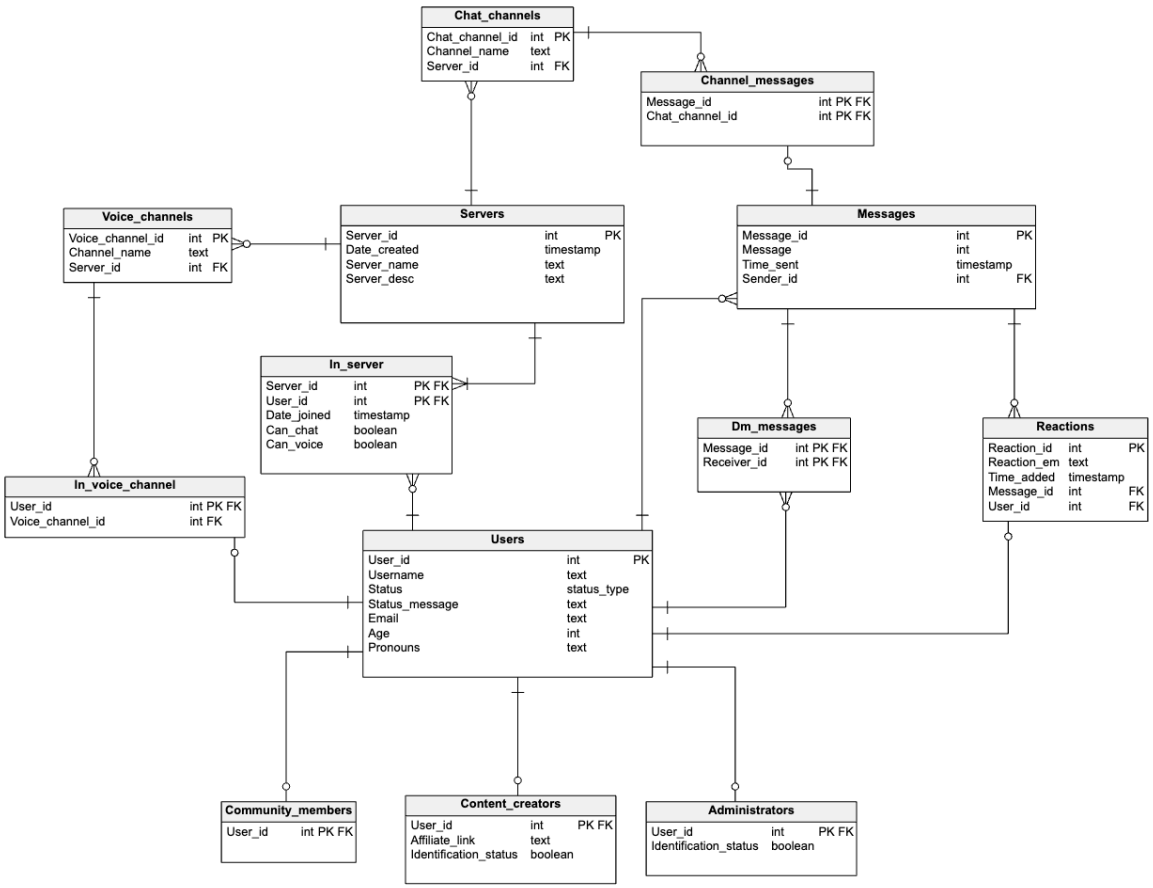
5. Normalization

servers(Server_id, date_created, server_name, server_desc)
in_server(Server_id, User_id, date_joined, can_chat, can_voice)
Users(User_id, Username, Status, Status Message, Email, Age, Pronouns)
Community_members(User_id)
Content_creators(User_id, affiliate_link, identification_status)
Administrators(User_id, identification_status)

Voice_channels(Voice_channel_id, Channel_name, Server_id)
In_voice_channel(Voice_channel_id, User_id)
Chat_channels(Chat_channel_id, Channel_name, server_id)
Messages(Message_id, message, time_sent, sender_id)
Reactions(reaction_id, reaction_emoji, time_added, message_id, user_id)
Channel_messages(message_id, chat_channel_id)
Dm_messages(message_id, receiver_id)

- Server is in BCNF because the left side of (a) gives all the attributes in the relation, and there are no partial or transitive dependencies. The other FDs do not apply to Server.
- In_server is in BCNF because the left side of (e) gives all the attributes in the relation, There are also no partial or transitive dependencies. The other FDs do not apply to In_server.
- User is in BCNF because the left side of (b) gives all the attributes in the relation. The other FDs do not apply to User and there are no partial or transitive dependencies.
- Community_member is in BCNF because none of the FDs apply to it, so there are no bad FDs.
- Content_creator is in BCNF because (c) gives all the attributes in this relation and there are no partial or transitive dependencies. The other FDs do not apply to Content_creator.
- Administrator is in BCNF because (d) gives all the attributes in this relation and there are no partial or transitive dependencies.
- Voice_channels is in BCNF because (f) gives all the attributes in this relation and there are no partial or transitive dependencies. The other FDs do not apply to Voice_channels.
- In_voice_channel is in BCNF because none of the FDs apply to this relation; there are no bad FDs.
- Chat_channel is in BCNF because (g) gives all the attributes in this relation
- Messages is in BCNF because (h) gives all the attributes in this relation and there are no partial or transitive dependencies. The rest of the FDs do not apply to Messages.
- Reaction is in BCNF because the left side of (i) determines the entirety of the relation, and there are no partial or transitive dependencies. None of the other FDs apply to Reaction.
- Channel_message is in BCNF because none of the FDs apply to it, so there are no bad FDs.
- Dm_message is in BCNF because none of the FDs apply to it, so there are no bad FDs. C

6. Physical Model



7. Queries

US1

```
* US1
    As a: Community Member
  I want: search for servers
 So that: I can find communities who share common interests


        SELECT server_name FROM servers

[(" '67262 students'",), (" 'ducks'",), (" '67262 class'",)]
+--------------------+
|      servers       |
+--------------------+
|  '67262 students'  |
|       'ducks'      |
|    '67262 class'   |
+--------------------+
lists out all the servers
```

US2

```
     As a: Community Member
   I want: to join a voice channel
  So that: I can communicate with others in the same community


        DELETE FROM In_voice_channel
         WHERE 0 = user_id


            INSERT INTO In_voice_channel (user_id, voice_channel_id)
                VALUES(0, 0)

user joined voice channel

        DELETE FROM In_voice_channel
         WHERE 1 = user_id

user not allowed to join voice channel

        SELECT * FROM In_voice_channel

[(2, 2), (3, 2), (6, 1), (0, 0)]
+----------+-------+
| user_id, | vc_id |
+----------+-------+
|    2     |   2   |
|    3     |   2   |
|    6     |   1   |
|    0     |   0   |
+----------+-------+
user 0 Jonathan is allowed to join voice channel 0 and succesffully joins it
user 1 Alicia is not allowed to join voice channel 2 and fails
```

US3

```
* US3
    As a: Content Creator
  I want: host polls using reactions
 So that: I can gauge interest in certain topics


        SELECT reaction_emoji, COUNT(reaction_id)
          FROM reactions
         WHERE message_id = 0
      GROUP BY reaction_emoji

[(" 'happy'", 2), (" 'sad'", 1)]
+----------+-------+
|  emoji   | count |
+----------+-------+
|  'happy' |   2   |
|   'sad'  |   1   |
+----------+-------+
displays emojis that have been reacted and the amount of each emoji reacted on specified message.
```

US4

```
* US4
    As a: Content Cretor
  I want: to count new users within a period
 So that: I can  see how well my brand is flourishing


        SELECT COUNT(user_id)
          FROM in_server
         WHERE Server_id = 0
               AND Date_joined BETWEEN 'Sun Sep 29 2024 02:29:58' AND 'Sun Dec 15 2024 02:29:58';

[(2,)]
+-------+
| count |
+-------+
|   2   |
+-------+
None
displays the amount of new users in specified server within specified time frame.
```

US5

```
* US5
    As a: Community member
  I want: join servers
 So that: I can find community who share common interests


        INSERT INTO In_server (server_id, user_id, date_joined, can_chat, can_voice)
            VALUES(1, 0, CURRENT_TIMESTAMP, False, False)


        SELECT * FROM In_server

[(0, 0, datetime.datetime(2024, 9, 30, 2, 29, 58), True, True),
 (0, 1, datetime.datetime(2024, 12, 1, 10, 29, 45), True, True),
 (1, 1, datetime.datetime(2024, 12, 2, 10, 28), True, False),
 (2, 0, datetime.datetime(2024, 9, 28, 2, 31, 34), True, False),
 (2, 1, datetime.datetime(2024, 9, 28, 5, 15), True, False),
 (2, 2, datetime.datetime(2024, 9, 15, 9, 0), True, True),
 (2, 3, datetime.datetime(2024, 9, 15, 9, 2), True, True),
 (2, 4, datetime.datetime(2024, 9, 16, 12, 0), True, True),
 (1, 5, datetime.datetime(2024, 5, 20, 3, 0, 31), True, True),
 (1, 2, datetime.datetime(2024, 5, 23, 4, 0), True, True),
 (0, 6, datetime.datetime(2024, 5, 23, 4, 0), True, True),
 (2, 6, datetime.datetime(2024, 5, 23, 4, 0), True, False),
 (1, 0, datetime.datetime(2024, 12, 6, 17, 16, 31, 368862), False, False)]
+------------+----------+----------------------------+-----------+-----------+
| Server_id, | User_id, |        Date_joined,        | Can_chat, | Can_voice |
+------------+----------+----------------------------+-----------+-----------+
|     0      |    0     |    2024-09-30 02:29:58     |    True   |    True   |
|     0      |    1     |    2024-12-01 10:29:45     |    True   |    True   |
|     1      |    1     |    2024-12-02 10:28:00     |    True   |   False   |
|     2      |    0     |    2024-09-28 02:31:34     |    True   |   False   |
|     2      |    1     |    2024-09-28 05:15:00     |    True   |   False   |
|     2      |    2     |    2024-09-15 09:00:00     |    True   |    True   |
|     2      |    3     |    2024-09-15 09:02:00     |    True   |    True   |
|     2      |    4     |    2024-09-16 12:00:00     |    True   |    True   |
|     1      |    5     |    2024-05-20 03:00:31     |    True   |    True   |
|     1      |    2     |    2024-05-23 04:00:00     |    True   |    True   |
|     0      |    6     |    2024-05-23 04:00:00     |    True   |    True   |
|     2      |    6     |    2024-05-23 04:00:00     |    True   |   False   |
|     1      |    0     | 2024-12-06 17:16:31.368862 |   False   |   False   |
+------------+----------+----------------------------+-----------+-----------+
jonathan joins duck server
each join server command can be run once since a user cannot join a server multiple times
```

US6

```
* US6
    As a: Server administrator
  I want: to assign server permissions
 So that: the server settings cannot be modified by untrusted individuals

User is not admin

        SELECT *
          FROM In_server

[(0, 0, datetime.datetime(2024, 9, 30, 2, 29, 58), True, True),
 (0, 1, datetime.datetime(2024, 12, 1, 10, 29, 45), True, True),
 (1, 1, datetime.datetime(2024, 12, 2, 10, 28), True, False),
 (2, 0, datetime.datetime(2024, 9, 28, 2, 31, 34), True, False),
 (2, 1, datetime.datetime(2024, 9, 28, 5, 15), True, False),
 (2, 2, datetime.datetime(2024, 9, 15, 9, 0), True, True),
 (2, 3, datetime.datetime(2024, 9, 15, 9, 2), True, True),
 (2, 4, datetime.datetime(2024, 9, 16, 12, 0), True, True),
 (1, 5, datetime.datetime(2024, 5, 20, 3, 0, 31), True, True),
 (1, 2, datetime.datetime(2024, 5, 23, 4, 0), True, True),
 (0, 6, datetime.datetime(2024, 5, 23, 4, 0), True, True),
 (2, 6, datetime.datetime(2024, 5, 23, 4, 0), True, False),
 (1, 0, datetime.datetime(2024, 12, 6, 17, 16, 31, 368862), False, False)]
+-----------+----------+----------------------------+-----------+-----------+
| Server_id, | User_id, |        Date_joined,        | Can_chat, | Can_voice |
+-----------+----------+----------------------------+-----------+-----------+
|     0     |    0     |    2024-09-30 02:29:58     |    True   |    True   |
|     0     |    1     |    2024-12-01 10:29:45     |    True   |    True   |
|     1     |    1     |    2024-12-02 10:28:00     |    True   |   False   |
|     2     |    0     |    2024-09-28 02:31:34     |    True   |   False   |
|     2     |    1     |    2024-09-28 05:15:00     |    True   |   False   |
|     2     |    2     |    2024-09-15 09:00:00     |    True   |    True   |
|     2     |    3     |    2024-09-15 09:02:00     |    True   |    True   |
|     2     |    4     |    2024-09-16 12:00:00     |    True   |    True   |
|     1     |    5     |    2024-05-20 03:00:31     |    True   |    True   |
|     1     |    2     |    2024-05-23 04:00:00     |    True   |    True   |
|     0     |    6     |    2024-05-23 04:00:00     |    True   |    True   |
|     2     |    6     |    2024-05-23 04:00:00     |    True   |   False   |
|     1     |    0     | 2024-12-06 17:16:31.368862 |   False   |   False   |
+-----------+----------+----------------------------+-----------+-----------+
```

```
       UPDATE In_server
          SET Can_chat = true, Can_voice = true
        WHERE Server_id = 2 AND User_id = 0


       SELECT *
         FROM In_server

[(0, 0, datetime.datetime(2024, 9, 30, 2, 29, 58), True, True),
 (0, 1, datetime.datetime(2024, 12, 1, 10, 29, 45), True, True),
 (1, 1, datetime.datetime(2024, 12, 2, 10, 28), True, False),
 (2, 1, datetime.datetime(2024, 9, 28, 5, 15), True, False),
 (2, 2, datetime.datetime(2024, 9, 15, 9, 0), True, True),
 (2, 3, datetime.datetime(2024, 9, 15, 9, 2), True, True),
 (2, 4, datetime.datetime(2024, 9, 16, 12, 0), True, True),
 (1, 5, datetime.datetime(2024, 5, 20, 3, 0, 31), True, True),
 (1, 2, datetime.datetime(2024, 5, 23, 4, 0), True, True),
 (0, 6, datetime.datetime(2024, 5, 23, 4, 0), True, True),
 (2, 6, datetime.datetime(2024, 5, 23, 4, 0), True, False),
 (1, 0, datetime.datetime(2024, 12, 6, 17, 16, 31, 368862), False, False),
 (2, 0, datetime.datetime(2024, 9, 28, 2, 31, 34), True, True)]
+-----------+----------+----------------------------+-----------+-----------+
| Server_id, | User_id, |        Date_joined,        | Can_chat, | Can_voice |
+-----------+----------+----------------------------+-----------+-----------+
|     0     |    0     |    2024-09-30 02:29:58     |    True   |    True   |
|     0     |    1     |    2024-12-01 10:29:45     |    True   |    True   |
|     1     |    1     |    2024-12-02 10:28:00     |    True   |   False   |
|     2     |    1     |    2024-09-28 05:15:00     |    True   |   False   |
|     2     |    2     |    2024-09-15 09:00:00     |    True   |    True   |
|     2     |    3     |    2024-09-15 09:02:00     |    True   |    True   |
|     2     |    4     |    2024-09-16 12:00:00     |    True   |    True   |
|     1     |    5     |    2024-05-20 03:00:31     |    True   |    True   |
|     1     |    2     |    2024-05-23 04:00:00     |    True   |    True   |
|     0     |    6     |    2024-05-23 04:00:00     |    True   |    True   |
|     2     |    6     |    2024-05-23 04:00:00     |    True   |   False   |
|     1     |    0     | 2024-12-06 17:16:31.368862 |   False   |   False   |
|     2     |    0     |    2024-09-28 02:31:34     |    True   |    True   |
+-----------+----------+----------------------------+-----------+-----------+
Raja gives Alicia permissions to chat and voice but fails because Raja is not an admin
Carol gives Jonathan permissions to chat and voice as Carol is an administrator
```

US7 (trigger)

Before:

```
+-----+----------------+---------+-----------------------+-----------------------------+-----+------------+
| uid |    username    |  status |     status_message    |            email            | age |  pronouns  |
+-----+----------------+---------+-----------------------+-----------------------------+-----+------------+
|  0  |     'jklai'    | offline |    'Hello everybody'  |  'laijonathankl@gmail.com'  |  20 |  'He/Him'  |
|  1  |    'alicia'    |   dnd   |          'Hi'         |     'alicia@gmail.com'      |  20 |  'She/Her' |
|  2  |     'sraja'    |   away  |  'use pomodoro method' |       'raja@cmu.edu'        |  99 |  'He/Him'  |
|  3  |   'xiaoying'   |  online |       'mongodb!'      |     'xiaoying@cmu.edu'      |  99 |  'He/Him'  |
|  4  |     'bob3'     |  online |         'hello'       |      'bobb@gmail.com'       |  34 |  'He/Him'  |
|  5  |     'carol'    |   away  |          ':D'         |   'carolbells@yahoo.com'    |  20 |  'She/Her' |
|  6  |  'tobedeleted' |   away  |          'eee'        |      'uhoh@uhoh.uhoh'       |  16 |  'She/Her' |
+-----+----------------+---------+-----------------------+-----------------------------+-----+------------+
+-----+-----+---------------------+----------+-----------+
| sid | uid |        joined       | canchat | canvoice |
+-----+-----+---------------------+----------+-----------+
|  0  |  6  | 2024-05-23 04:00:00 |   True  |   True   |
|  2  |  6  | 2024-05-23 04:00:00 |   True  |  False   |
+-----+-----+---------------------+----------+-----------+
+-----+-----+
| cid | uid |
+-----+-----+
|  6  |  1  |
+-----+-----+
```

After:

```
* US7
    As a: User
  I want: to delete my account
 So that: I can stop using discord

None
+-----+-------------+---------+-----------------------+-----------------------------+-----+------------+
| uid |   username  |  status |     status_message    |            email            | age |  pronouns  |
+-----+-------------+---------+-----------------------+-----------------------------+-----+------------+
|  0  |    'jklai'  | offline |    'Hello everybody'  |  'laijonathankl@gmail.com'  |  20 |  'He/Him'  |
|  1  |   'alicia'  |   dnd   |          'Hi'         |     'alicia@gmail.com'      |  20 |  'She/Her' |
|  2  |    'sraja'  |   away  |  'use pomodoro method' |       'raja@cmu.edu'        |  99 |  'He/Him'  |
|  3  |  'xiaoying' |  online |       'mongodb!'      |     'xiaoying@cmu.edu'      |  99 |  'He/Him'  |
|  4  |    'bob3'   |  online |         'hello'       |      'bobb@gmail.com'       |  34 |  'He/Him'  |
|  5  |    'carol'  |   away  |          ':D'         |   'carolbells@yahoo.com'    |  20 |  'She/Her' |
|  6  |      !      | deleted |           !           |             !               |  0  |     !      |
+-----+-------------+---------+-----------------------+-----------------------------+-----+------------+
+-----+-----+--------+---------+----------+
| sid | uid | joined | canchat | canvoice |
+-----+-----+--------+---------+----------+
+-----+-----+--------+---------+----------+
+-----+-----+
| cid | uid |
+-----+-----+
+-----+-----+
deletes specified user from corresponding child of user (content creator, community member, or administrator), then sets all the value
s in user to default values. When user is deleted from one of the three tables, the trigger runs to delete all instances of the user f
rom voice channels and servers. (triggers are created in initialize.sql)
```

US8

```
* US8
    As a: Community member
  I want: to send a direct message
 So that: I can communicate with peers in different time zones


        INSERT INTO Messages(Message_id, Message, Time_sent, Sender_id)
            VALUES(6, 'hello Alicia', CURRENT_TIMESTAMP, 0);
        INSERT INTO Dm_messages(Message_id, Receiver_id)
            VALUES(6, 1);


        SELECT m.Sender_id, d.Receiver_id, m.message
          FROM Messages AS m JOIN Dm_messages AS d ON m.Message_id = d.Message_id
         WHERE m.Sender_id = 0
               AND d.Receiver_id = 1
         ORDER BY m.message_id DESC

[(0, 1, 'hello Alicia'), (0, 1, " 'lets work on phase 2 tmrw'")]
+------------+--------------+------------------------------+
| sender_id, | receiver_id, |           message            |
+------------+--------------+------------------------------+
|     0      |      1       |         hello Alicia         |
|     0      |      1       |  'lets work on phase 2 tmrw' |
+------------+--------------+------------------------------+

        INSERT INTO Messages(Message_id, Message, Time_sent, Sender_id)
            VALUES(7, 'Xiaoying, do you know I actually really love database', CURRENT_TIMESTAMP, 2);
        INSERT INTO Dm_messages(Message_id, Receiver_id)
            VALUES(7, 3);


        SELECT m.Sender_id, d.Receiver_id, m.message
          FROM Messages AS m JOIN Dm_messages AS d ON m.Message_id = d.Message_id
         WHERE m.Sender_id = 2
               AND d.Receiver_id = 3
         ORDER BY m.message_id DESC

[(2, 3, 'Xiaoying, do you know I actually really love database')]
+------------+--------------+-----------------------------------------------------------+
| sender_id, | receiver_id, |                         message                           |
+------------+--------------+-----------------------------------------------------------+
|     2      |      3       | Xiaoying, do you know I actually really love database |
+------------+--------------+-----------------------------------------------------------+
Jonathan user0 sends DM to Alicia user1 saying 'hello Alicia'
Raja user2 sends DM to Xiaoying user3 saying 'Xiaoying, do you know I actually really love database'
```

US9

```
* US9
    As a: Community Member
  I want: to count my interactions with each server (messages, reactions, voice calls)
 So that: I can gauge my activity with each community


        WITH msgs AS (
            SELECT s.server_id AS sid, COUNT(c.chat_channel_id) AS cntm
            FROM servers AS s
            LEFT JOIN chat_channels AS c ON s.server_id = c.server_id
            LEFT JOIN channel_messages AS cm ON c.chat_channel_id = cm.chat_channel_id
            LEFT JOIN messages AS m ON m.message_id = cm.message_id
            WHERE m.sender_id = 2
            GROUP BY s.server_id
        ),
        reactns AS (
            SELECT s.server_id AS sid, COUNT(r.reaction_id) AS cntr
            FROM servers AS s
            JOIN chat_channels AS c ON s.server_id = c.server_id
            JOIN channel_messages AS cm ON c.chat_channel_id = cm.chat_channel_id
            JOIN reactions AS r ON cm.message_id = r.message_id
            WHERE r.user_id = 2
            GROUP BY s.server_id
        )
        SELECT s.server_name, s.server_id, coalesce(cntm, 0), coalesce(cntr, 0), (coalesce(cntm, 0) + coalesce(cntr, 0))
        FROM servers AS s FULL OUTER JOIN msgs AS m ON s.server_id = m.sid
        FULL OUTER JOIN reactns AS r ON s.server_id = r.sid


[(" '67262 students'", 0, 0, 0, 0),
 (" 'ducks'", 1, 0, 1, 1),
 (" '67262 class'", 2, 1, 0, 1)]
+------------------+----------+----------+--------------+-------+
|     servername   | serverid | messages | interactions | total |
+------------------+----------+----------+--------------+-------+
|  '67262 students' |    0     |    0     |      0       |   0   |
|       'ducks'     |    1     |    0     |      1       |   1   |
|    '67262 class'  |    2     |    1     |      0       |   1   |
+------------------+----------+----------+--------------+-------+
counts and categorizes the interactons made by user 2 Raja
```

US10 (window)

```
* US10
    As a: Administrator
  I want: to rank users by interaction
 So that: I can analyze how active the members are


       WITH temp AS (
           SELECT u.user_id AS uid, u.username AS username, COUNT(m.message_id) AS count
             FROM servers AS s
             JOIN chat_channels AS c ON s.server_id = c.server_id
             JOIN channel_messages AS cm ON c.chat_channel_id = cm.chat_channel_id
             JOIN messages AS m ON cm.message_id = m.message_id
             JOIN users AS u ON m.sender_id = u.user_id
            WHERE s.server_id = 2
         GROUP BY u.user_id, u.username
       )
       SELECT (RANK() OVER w) AS rank, uid, username, count
         FROM temp
       WINDOW w AS (ORDER BY count DESC)
     ORDER BY rank

[(1, 6, '!', 2), (2, 2, " 'sraja'", 1)]
+------+--------+----------+--------------+
| rank | userId | username | interactions |
+------+--------+----------+--------------+
|  1   |   6    |    !     |      2       |
|  2   |   2    |  'sraja' |      1       |
+------+--------+----------+--------------+
None
given a server id, prints the users along with the amount of messages they have sent in the server, along with a rank, determined by amount o
f messages sent in server. results are sorted in ascending order of rank.
```